South Fremont/Warm Springs Area Studies

Appendix B:
Transformational Opportunities White Paper

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STRATEGICECONOMICS

September 2011

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I. INTRODUCTION

The New United Motor Manufacturing Inc. (NUMMI) plant, which closed in April 2010, has been operating as an auto manufacturing plant since the early 1960s in the Warm Springs District of Fremont, California. General Motors (GM) first opened the facility as an expansion of a much smaller factory that had been located in Oakland since the 1930s. GM closed the plant in the early 1980s, but it reopened again after two years as NUMMI, which was a joint venture between GM and Toyota. After GM declared bankruptcy in 2009, Toyota declined to keep the plant open, despite much work on the part of the State of California and the City of Fremont to keep it open and NUMMI produced its last car on April 1, 2010. The closure resulted in the loss of 4,700 jobs at the site, and impacted an estimated 300 companies in California representing an estimated 30,000 jobs. Given the major loss to the City, the State, and the U.S. manufacturing base, the NUMMI closure has attracted the attention of all levels of government. To address this challenge, the U.S. Economic Development Administration (EDA) awarded the City of Fremont a $333,000 grant to prepare four studies:

1) Economic and Market Strategic Plan
2) Land Use Alternatives Analysis
3) Infrastructure and Cost Analysis
4) Financial Assessment

The purpose of this White Paper is to inform all four documents to be completed under the EDA grant by framing a discussion of realistic opportunities for redevelopment and reuse in the South Fremont/Warm Springs industrial area. The City of Fremont has defined an approximate 850-acre Study Area which includes, but is not limited to, the 5.5 million-square foot former NUMMI plant. In May 2010, Toyota announced that it was investing $50 million in a start-up electric car company, Tesla Motors, and Tesla announced that it was purchasing the entire NUMMI factory. NUMMI formally vacated the plant in October 2010 and Tesla is now preparing to ramp up operations in the plant. Although at its peak, NUMMI produced over 400,000 cars and light trucks a year, Tesla will initially produce about 20,000 cars annually. However, the company has several joint ventures with other car manufacturers, including Toyota, to produce components for their cars. Over the next five to ten years, Tesla anticipates occupying the entire 5.5 million-square foot factory.

As the City contemplates a set of alternative futures for the study area and develops policies and public investment strategies to support the preferred future, the Consultant Team is seeking to understand the viability of a research, development, and production-based vision, given the opportunities presented by Tesla as a potential anchor use, the new Bay Area Rapid Transit (BART) station at Warm Springs scheduled to open in the area in 2015, and potential UPRR constraints.

This White Paper charts the major changes in the economic scale and focus of industrial production in recent decades in the United States the Bay Area, and Fremont; identifies industrial sectors with promise for the future in Fremont; and summarizes the regional and local context of the Study Area. This White Paper, along with a summary of the Baseline Market Study (now incorporated in the Economic and Market Strategic Plan), was presented to a panel

of industry experts. A list of key questions for discussion was also developed and distributed to the panelists in order to mine the substantial and varied experiences of the panelists and to help the Consulting Team answer the following fundamental questions for the City:

> *Could this existing industrial area on the edge of arguably the most innovative region in the world become a vital zone for 21st Century American industrial production? If so, what would that look like, and what is needed to foster this activity?*

The questions for panelists provided in this chapter were developed based on the supporting background information and analysis provided in this White Paper, the other materials included in this package, associated stakeholder interviews, and prior work in the City of Fremont. In addition to this introductory chapter, the White Paper presents six chapters, including:

- A summary of the expert panel recommendations.
- A brief description of the South Fremont/Warm Springs Study Area.
- Overview of historical industrial production and performance at the national, State, and regional levels.
- Description of key factors that will continue to influence the nature and scale of industrial production in the United States.
- Identification of promising trends and sectors.
- Opportunities for Bay Area/South Fremont industrial expansion.

It is important to note that this White Paper was prepared and the expert panel discussion occurred before the sale of the two large NUMMI-owned parcels north and south of the Tesla Factory to Union Pacific Railroad (UP). As such, it does not emphasize or explore extensive logistic operations. If, in the future, UP develops these parcels for rail uses (e.g., freight railyard), additional analysis on logistic uses should be completed.

Questions for Panel Consideration

The following questions were created with the intention of guiding the panelists in their discussion about the full range of issues under consideration in formulating various land use alternatives for the Study Area. However, the panel discussion was not structured to specifically answer each of these questions individually. Rather, these questions were used to help "spark" discussion among the panelists.

Global Competitiveness for Industrial/Production; Niche for the United States, the Bay Area, and Fremont

1. In your view, will the trends toward declining employment in manufacturing, both from increased productivity and off-shoring, continue at the rates we have seen in the last ten years, or are they likely to level off or reverse? How might these trends contribute to the competition that California faces with other states, or even within California (i.e., competition between northern California vs. southern California vs. Central Valley)?

2. Cost is the critical consideration driving off-shoring of manufacturing employment. What are the most important factors that militate against off-shoring of manufacturing jobs? Are there types of manufacturing jobs with less potential for off-shoring and, if so, what are they?

3. Are there emerging sectors or subsectors where keeping some or all manufacturing in the United States is particularly advantageous? If so, why?

4. To what extent do you think retaining U.S. manufacturing jobs is important to keeping R&D and innovation sectors of industry competitive in the United States?

5. What specifically do you see as Fremont's "niche" within the Bay Area as an employment location that could capitalize both on the Study Area's strength, and the region's economic momentum?

Promising Industries for Fremont

6. In light of the integration of green-tech R&D and manufacturing in the Bay Area, what do you think the prospects are for Fremont to capture more of the R&D components of the industry?

7. Do you think Tesla's long-term commitment to manufacturing in Fremont will attract other green-tech businesses, or businesses from other sectors?

8. Do you think the clustering of green tech businesses in Fremont will help attract additional federal and State subsidies, or make the area less competitive for these funds?

9. How likely do you think it is that AB 32 and other climate change and environmental legislation will spur green tech manufacturing jobs in the United States and the Bay Area?

Market Outlook

10. Given what you've seen with emerging industries both in the Bay Area and/or elsewhere in the United States, how long would you expect it to take for the South Fremont/Warm Springs area to start generating development interest from businesses, and what kind of ramp up

time would you expect to see, especially since we are coming out of such a deep recession? What types of incentives might the City of Fremont provide that would have potential to attract targeted uses over time? How long should the City be prepared to wait to achieve the desired land use mix in the face of more immediate market demands?

Industrial Space Characteristics

11. Recent trends in manufacturing have shown steady increases in value added output, while employment has steadily declined. What are the implications for the kinds of facilities and the amount of building space that will be required for industrial production activities in the future?

12. Do you have any "rules of thumb" about employment densities for the kinds of promising industrial sectors covered in the White Paper, either by square feet per worker, or workers per acre? What kinds of buildings are best suited to accommodate these industries (single-story tilt up, multi-story, some mix of office, production space and/or warehouse, etc.)? What are the physical built environment and infrastructure criteria that the promising industrial sectors are looking for in a site and building(s)?

South Fremont/Warm Springs Site Attributes and Opportunities

13. The South Fremont/Warm Springs Study Area has many potentially valuable attributes including 1) access to a large diverse labor force, 2) BART service, and 3) proximity to existing businesses in innovation clusters including green tech manufacturing, power, water, flat undeveloped land, and rail access. Which of these attributes do you think will be of the most value to "transformational" industries and why?

14. In your experience, what are the potential issues related to land use compatibility between residential development and some of the potential enterprises that could come to the Study Area, including the manufacturing processes associated with such industries as electric car production, solar and/or wind power systems production, biotech, or any other industry that you see as having potential at the site? Would housing in proximity to these facilities be an asset or a liability?

15. To what extent do you think the Warm Springs BART station will help attract TOD opportunities such as residential, retail, office/R&D, or others to the Study Area? Do you see potential for change over time from an industrial base in the Study Area to some other range of uses? If so, should that change occur and how should that change occur?

16. Do you have any insights on how to structure the Plan for the South Fremont area that would allow for both flexibility, but create some "near term" certainty that could attract early users?

Role of Public Policy in Transforming South Fremont/Warm Springs

17. Given the complex factors that drive business location in a globalized economy, what role can local land use policy and economic development strategies play in retaining or recapturing industrial production in the United States and the Bay Area?

18. What, if any, are good models where cities have been able to guide incremental growth in leading edge industries and what lessons do you think are directly transferable to Fremont?

19. Beyond providing traditional local government incentives for private development including zoning, infrastructure improvements, and possible assistance with brownfield remediation, is there a "portfolio" of services or other programmatic activities that the City should be trying to assemble to assist in attracting new industries to the South Fremont/Warm Springs Area?

20. Given that the Bay Area clearly has considerable potential for growth in many key industries, what is the most effective process the City of Fremont can pursue in translating this potential into reality, given that the City only controls zoning and public investments, but no land in the Study Area?

II. EXPERT PANEL SUMMARY AND RECOMMENDATIONS

The purpose of the Expert Panel was to obtain national and regional expert input regarding (1) the future of manufacturing nationally and in the region, (2) emerging industry trends, (3) the major opportunities for reuse and redevelopment of the former NUMMI plant and site, and (4) key policy actions to support a sustainable industrial future in Fremont.

Panel Summary

The panelists selected were from a range of backgrounds including regional and national experts in the fields of economics, international and national trade, manufacturing, workforce development, emerging markets, and emerging industrial trends. Attendees included:

- Ro Khanna—Deputy Assistant Secretary for Domestic Operations, U.S. & Commercial Service, International Trade Administration, U.S. Department of Commerce
- Nancey Green Leigh—Professor, Director of City and Regional Planning Doctoral Program, Georgia Institute of Technology
- Jed Kolko—Associate Director and Research Fellow, Public Policy Institute of California
- Jim Wunderman—President and CEO, Bay Area Council
- Michael Cohen—Partner, Strada Group
- Malcolm Appelbe—International Trade Cost Management, Lam Research

In addition to the questions listed in the Introduction, the panelists were provided with a Baseline Market Study describing the existing conditions, supply and demand of various land uses in the market area for the Study Area. The panelists were also provided with an earlier draft of the information provided in the following sections of this White Paper.

Panel Insights and Recommendations

Panelists were in general agreement that Fremont is well-positioned to compete globally based on the strengths of the Bay Area as well as Fremont's specific strengths. Fremont and the site have several distinct competitive advantages to build on including a diverse and highly educated workforce, a family-friendly community, several existing strong innovation industry clusters and an excellent supplier network, an inventory of existing buildings and vacant land to accommodate a wide range of industry needs, large vacant sites, BART, freeway and rail access, and Tesla.

The Panel believes that Fremont will continue to serve as a key location for "Innovation Industries" because it already plays a key role in the Bay Area economy. In addition, the Bay Area continues to be a global leader in many kinds of industrial activities at the intersection between R&D and production. While labor costs can be a key issue, the Panel felt that Fremont

is not, and has never been, a low-cost production location relative to other places in the United States, nor does it need to be. As long as the focus is on "innovation industries," the advantages of locating in the Bay Area far outweigh the additional costs.

In addition the City is already doing many of the things the Panel suggested including maintaining current and relevant industrial zoning, one-stop permitting, working with PR people to create a "brand" for Fremont emphasizing innovation, working with Ohlone Community College on workforce training issues and meeting with domestic and foreign companies interested in the Study Area.

In terms of common pitfalls and lessons learned from other economic development strategies, the Panel agreed that giving tax incentives to individual businesses did not produce enough of a return. Maintaining revenue is far more important because the City will need a strong fiscal base to provide the high quality services necessary to provide the infrastructure for innovation.

Strategic Guidance

The Panel developed a list of key elements for the Economic and Market Strategic Plan and Land Use Alternatives. The Plan should establish a strong vision for the area as a place where businesses can "Plug In" to an existing district with the right "infrastructure for innovation." Place making will be critical to establishing this area as a 21st century work place. The Study Area should reflect the highest urban design standards for the public realm and will require careful planning to set a model for a high quality planned industrial zone which may include housing. If housing is to be included, it will be necessary to plan for a strong residential neighborhood that can accommodate a range of household types, including families, in a higher-density, mixed use district near BART. In addition, educational institutions that also "foster Innovation"—a technology-based charter high school or a community college level facility with a "tech shop" —are just a couple of examples.

The strategy for this area should be two-pronged. First, create a plan that equally balances entitlement certainty with the option for some land use flexibility, letting the market take its course. Second, pursue specific "Game-Changing" strategies such as:

- Working with BART and the High-Speed Rail Authority to put rail car manufacturing at the site.
- Recruiting Chinese manufacturers looking for American locations to meet "local content" requirements.

The Panel generated a list of key implementation strategies necessary to achieve the vision described above.

- Continue working to establish a redevelopment project area.
- Establish a foreign trade zone within the Study Area.
- Hire a lobbyist to work with the State and federal government on removing long term trade barriers and providing financial support for framework infrastructure.
- Pursue "Game-Changers" but be prepared to "pivot" based on unforeseen opportunities.

- Take a master plan approach to planning the Study Area to implement highest quality planning.

III. Study Area Overview

The South Fremont/Warm Springs Study Area encompasses approximately 850 acres. As **Figure A-1** in **Appendix A** shows, the area outlined in orange is the entire former NUMMI property, which is subdivided into three parcels. At the time this White Paper was published, NUMMI still owned the northern parcel, Parcel 1, and the southern parcel, Parcel 3. The middle parcel, Parcel 2, is now owned by Tesla Motors. When NUMMI was operating the plant, the company was concerned about potential conflicts with housing (and other assembly-type uses), and thus maintained a strict buffer around the facility. This impacted planning for the area around the future BART station as NUMMI did not want any new conflicting land uses in the area. However, Tesla, looking to model its operations after Porsche, is receptive to a variety of adjoining land uses. The main Porsche facility has operated in Stuttgart Germany for 50 years adjacent to a residential neighborhood.

Railroad tracks bisect the Study Area on a north-south axis. To the east of the tracks is a mixed grouping of industrial and R&D buildings. The best access to the site is from Highway 680 to the east, with additional access to Highway 880 to the west and south. **Figure A-2** shows the opportunities and constraints for future industrial development, and **Figure A-3** shows the opportunities and constraints for mixed uses. While there are currently virtually no housing units in the Study Area, there are extensive residential neighborhoods to the southeast and east of the Study Area's boundaries. See **Appendix A** for area and site maps.

IV. INDUSTRIAL PRODUCTION AND PERFORMANCE

Technological advances and automation as well as globalization, off-shoring, and international trade policy have combined to transform the nature and scale of industry in the United States over the last 60 years. Significant declines in the proportion of the U.S. labor force employed in the manufacturing sector have precipitated an ongoing debate about the role of manufacturing in the United States and other advanced western economies. With growing U.S. trade deficits in manufacturing goods since the mid-1990s, driven in large part by trade with China, debates about globalization, fair trade, open markets, and exchange rate policy have also come to the fore.

As recently as 2005 with unemployment below 5 percent, many remained optimistic that the rapid expansion in the service sector could continue to replace the lost manufacturing jobs. The experience of the last several years—the pain and enduring unemployment and underemployment of the Great Recession and its aftermath, the collapse in consumer spending, and the fiscal crises facing State and local governments—are challenging this belief. With off-shoring in the service sector also on the rise, many have started to ask whether a revival in industrial production—"actually making things"—is the only way to: (1) guarantee a continued role for the United States as a major economic power, and (2) generate sufficient jobs for the range of education and skill levels inevitably present in a large economy, recognizing also the broad array of services required to support industrial production.

This is certainly the perspective of the current U.S. administration as it has been of other advanced economies in Europe. As reported by the New York Times: "The Obama administration argues [...] that the United States cannot sustain itself as a global economic power without a thriving manufacturing sector. Too much research and development, too many well-paid jobs and too many exports flow from manufacturing."[1]

National

In the 1950s, the United States produced 45 percent of the manufactured goods and supplied most of the raw materials in the world, supporting an average of nearly 16 million jobs in the manufacturing industry sector during that decade. At that time, the share of U.S. manufacturing jobs peaked at more than 30 percent, but has since declined to just 9.25 percent (in 2009).[2]

The downturn in manufacturing has been deep and broad, and no other sector has lost so much ground relative to the rest of the economy. Manufacturing's share of value added output as a percentage of real gross domestic product peaked at nearly 30 percent in the 1950s, generating an annual average of $720 billion of manufacturing value in the 1950s (in constant 2009

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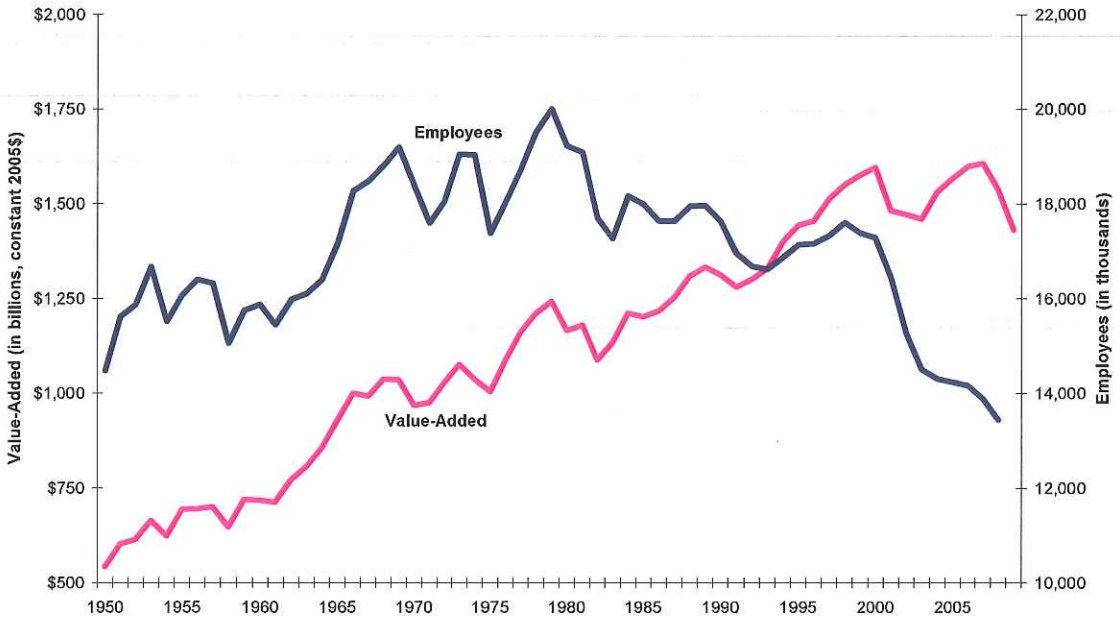
[1] Uchitelle, Louis. Ron Bloom Is Obama's Manufacturing Emissary. The New York Times. September 9, 2011.

[2] Policy Recommendations to Create U.S. Manufacturing Jobs. Silicon Valley Leadership Group. September 2010.

dollars). Although the value added output of the manufacturing sector has since grown to equal an annual average of $1.7 trillion during the past decade, an annual real growth rate of 1.7 percent between 1950 and 2009, the manufacturing sector's share of U.S. gross domestic product declined to just 11 percent in 2009. Other sectors of the economy grew faster with an average annual rate of 3.2 percent in GDP for the whole U.S. economy in constant dollar terms between 1950 and 2010 (see **Figure 1**).

Figure 1: U.S. Manufacturing: Value-Added and Employees



Source: Bureau of Labor Statistics; Bureau of Economic Analysis; Economic & Planning Systems, Inc.

In 2000, the manufacturing sector generated $1.6 trillion in value-added GDP (2005 dollars), about three times more than in 1950 in constant dollar terms, and generated 17.3 million jobs, about 20 percent more than in 1950. Since 2000, manufacturing employment has gone into freefall, while manufacturing value-added has declined by about 10 percent to $1.43 trillion. Between 2000 and 2009, the nation lost more than 30 percent of its manufacturing job base—approximately 5.2 million jobs—with the loss of 2 million of these jobs occurring since the start of the recession in December 2007.[3] **Figures 2** and **3** illustrate the ongoing trend of manufacturing job loss as well as the more variable experience of manufacturing output over the last twenty years. **Tables 1** and **2** present more recent trends in employment and output detail by manufacturing industry subsector (three-digit NAICS code), showing their relative contributions to current U.S. manufacturing output and employment as well as relative levels of growth/decline.

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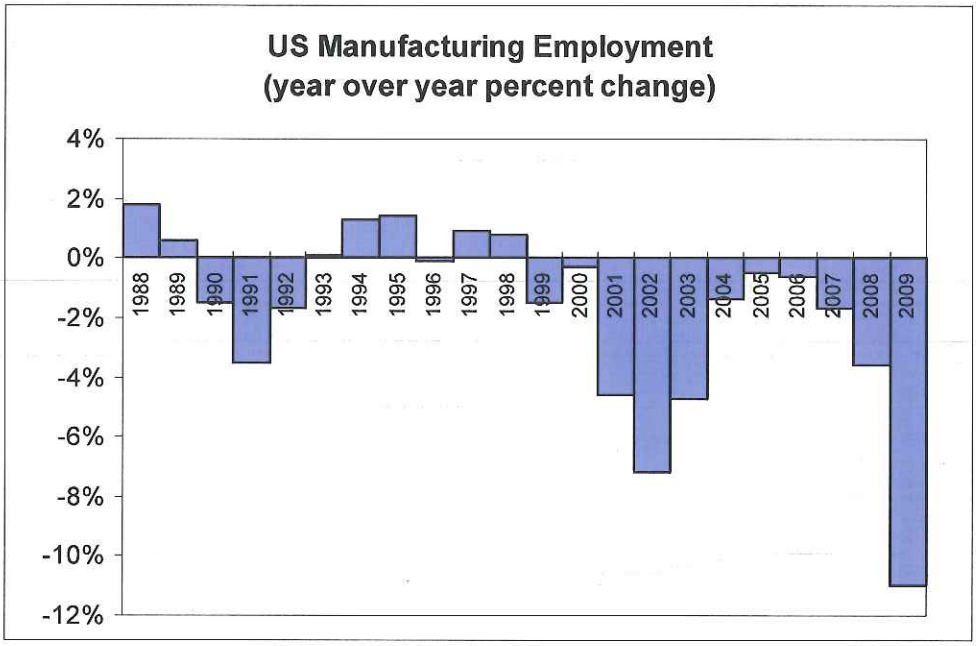
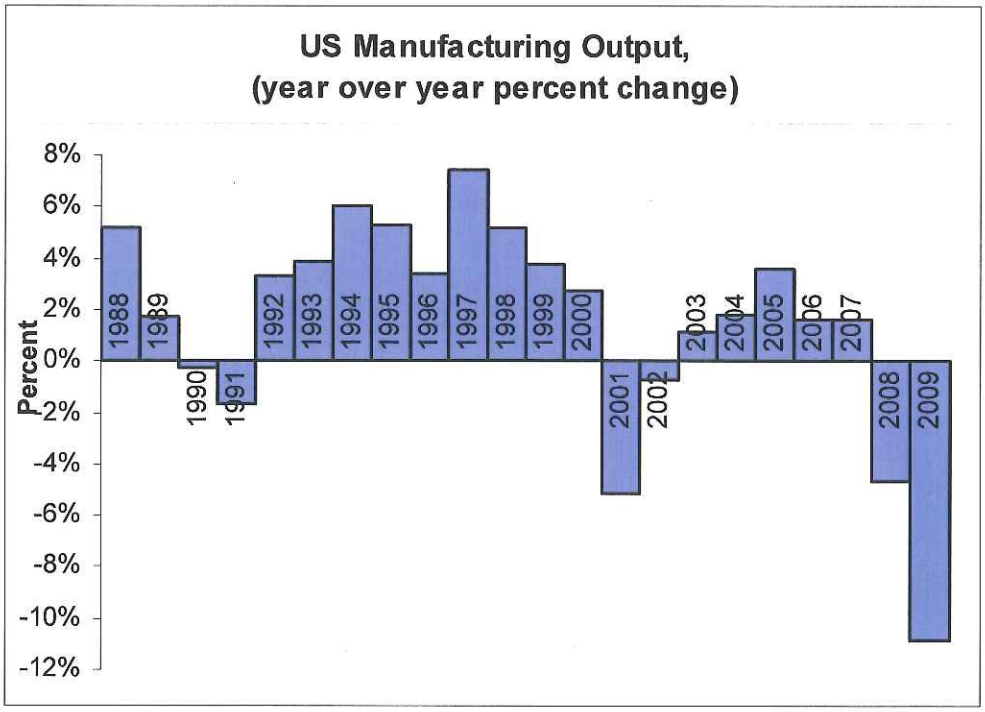
[3] Uchitelle, Louis. Ron Bloom Is Obama's Manufacturing Emissary. The New York Times. September 9, 2010.

Figure 2: U.S. Manufacturing Change in Annual Employment



Source: Bureau of Labor Statistics; Economic & Planning Systems, Inc.

Figure 3: U.S. Manufacturing Change in Annual Output (in nominal dollar terms)



Source: Bureau of Economic Analysis; Economic & Planning Systems, Inc.

Table 1
US Manufacturing Employment
South Fremont/Warm Springs Area Transformational Opportunities; EPS #20050

	Percent of Total Manufacturing Employment (2009)	Rank	Percent Change in Employment (2001 through 2009)	Rank
US Manufacturing				
Food manufacturing	12.3%	1	-6.8%	2
Transportation equipment manufacturing	11.5%	2	-29.7%	9
Fabricated metal product manufacturing	11.1%	3	-21.7%	6
Computer and electronic product manufacturing	9.6%	4	-35.2%	14
Machinery manufacturing	8.6%	5	-25.0%	7
Chemical manufacturing	6.8%	6	-16.1%	4
Plastics and rubber products manufacturing	5.3%	7	-30.1%	11
Miscellaneous manufacturing	4.9%	8	-18.7%	5
Printing and related support activities	4.4%	9	-31.8%	12
Paper manufacturing	3.4%	10	-29.7%	10
Nonmetallic mineral product manufacturing	3.3%	11	-28.2%	8
Furniture and related product manufacturing	3.2%	12	-40.4%	18
Electrical equipment and appliance mfg.	3.1%	13	-32.7%	13
Primary metal manufacturing	3.1%	14	-36.2%	15
Wood product manufacturing	3.0%	15	-37.1%	16
Beverage and tobacco product manufacturing	1.6%	16	-9.8%	3
Apparel manufacturing	1.4%	17	-60.6%	20
Textile product mills	1.1%	18	-38.0%	17
Textile mills	1.0%	19	-62.5%	21
Petroleum and coal products manufacturing	1.0%	20	-5.3%	1
Leather and allied product manufacturing	0.2%	21	-50.8%	19

Source: Bureau of Labor Statistics; Economic & Planning Systems, Inc.

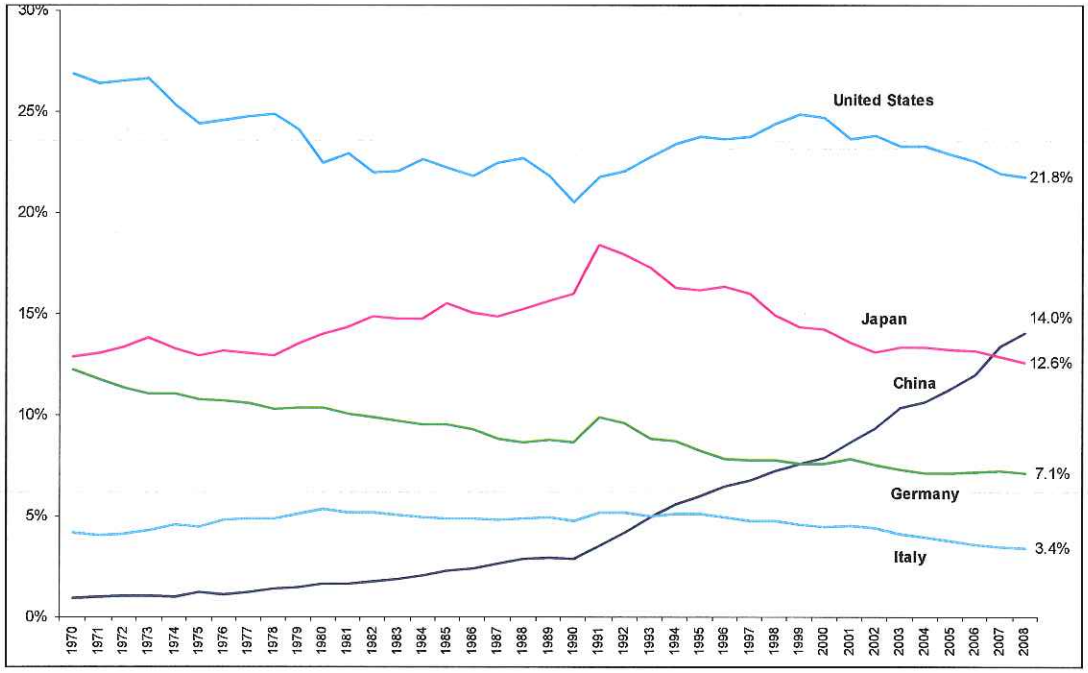
Table 2
US Manufacturing Output
South Fremont/Warm Springs Area Transformational Opportunities; EPS #20050

	Percent of Total Manufacturing Output (2007)	Rank	Percent Change in Output (1998 through 2008)	Rank
US Manufacturing				
Chemical manufacturing	15.4%	1	41.8%	4
Food product manufacturing	10.8%	2	35.8%	5
Computer and electronic product manufacturing	9.0%	3	26.9%	7
Fabricated metal product manufacturing	8.7%	4	20.1%	9
Machinery manufacturing	7.8%	5	9.2%	10
Motor vehicle, body, trailer, and parts manufacturing	6.1%	6	-17.5%	17
Other transportation equipment manufacturing	5.9%	7	60.5%	2
Miscellaneous manufacturing	4.5%	8	58.3%	3
Petroleum and coal products manufacturing	4.4%	9	207.1%	1
Plastics and rubber products manufacturing	4.1%	10	8.8%	11
Primary metal manufacturing	3.9%	11	21.8%	8
Electrical equipment and appliance manufacturing	3.6%	12	32.0%	6
Nonmetallic mineral product manufacturing	3.4%	13	-0.9%	14
Paper manufacturing	3.1%	14	8.7%	12
Printing and related support activities	3.0%	15	-3.9%	16
Furniture and related product manufacturing	2.2%	16	0.2%	13
Wood product manufacturing	1.9%	17	-1.5%	15
Textile and textile product mills	1.2%	18	-40.6%	18
Apparel manufacturing	1.0%	19	-40.7%	19

Source: Bureau of Economic Analysis; Economic & Planning Systems, Inc.

Still, the United States was the world's largest manufacturing economy in 2009, as measured by output, producing 22 percent of global manufacturing output (in constant 2009 dollars)—since 1975, the United States has represented between 20 and 25 percent of global manufacturing output (see **Figure 4**). The type of manufacturing activities that remain in the United States tend to be the most advanced, typically requiring close coordination with engineering and design staff during the production cycle (as discussed below). The U.S. manufacturing sector, today, supports nearly 12 million direct jobs in addition to a broad array of supporting service sector and other jobs.[4] This reflects a modest rebound in employment since the start of 2010 (1.5 percent), primarily concentrated in four industries: automotive, fabricated metals, primary metals, and machinery.[5] The unemployment rate for manufacturing workers dropped to 9.6 percent in September 2010 from 12.1 percent in 2009.

Figure 4: Share of Total Global Output, Leading Manufacturers



Source: United Nations Statistics Division

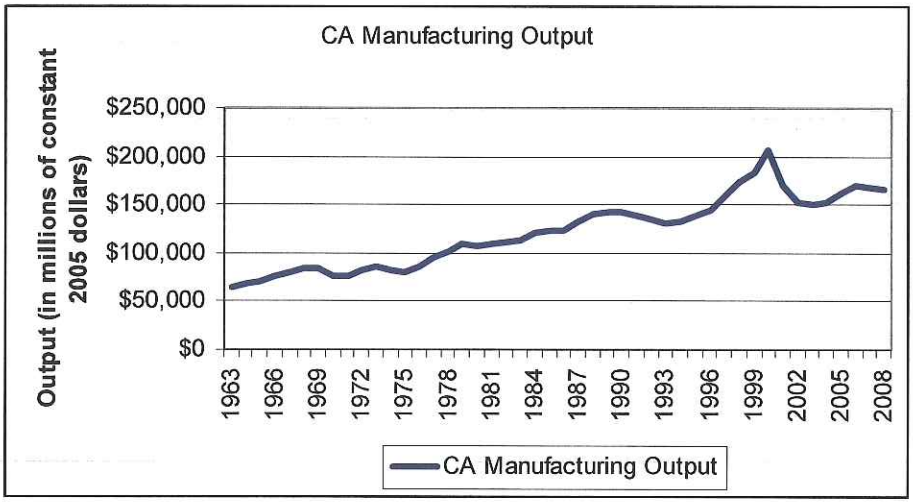
[4] National Association of Manufacturers. Manufacturing Strategy for Jobs and a Competitive America. June 2009.

[5] Isidore, Chris. Surprise! Blue Collar Jobs Are Coming Back. CNNMoney.com. September 27, 2010.

California

California is the world's eighth largest economy, contributing 13 percent to the nation's GDP, up from 11 percent in the 1960s.[6] Historically, the manufacturing sector has played a prominent role in sustaining the State's economy; for example, contributing an average of more than 20 percent to the state's gross state product in the 1960s.[7] In 2008 and for most of the past decade, manufacturing's share of California's gross state product was 10 percent, with $181.1 billion of value generated in 2008 relative to $1.85 trillion of gross state product. Between 1963 and 2008, manufacturing output in California grew at an annual rate of 2.1 percent in constant dollar terms, above the annual average manufacturing output growth rate for the United States, but below rate of growth for gross state product of about 3.6 percent annually over the same period (also in constant dollar terms).

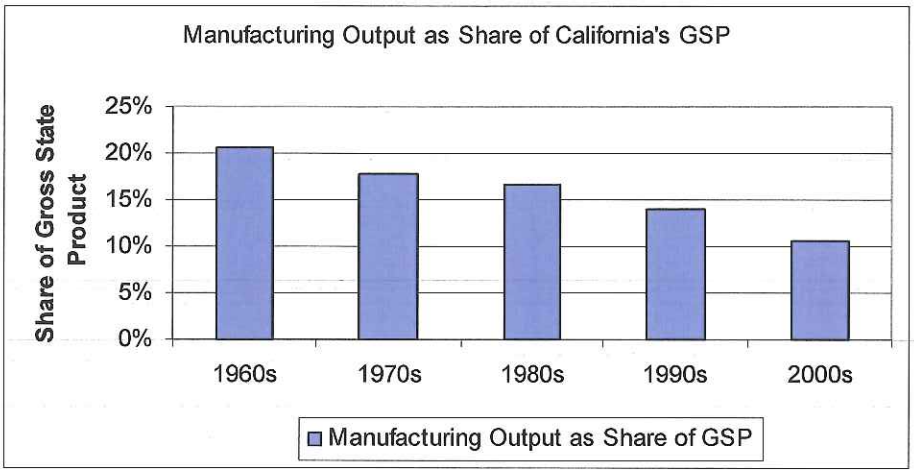
Figure 5: California Manufacturing Output



[6] Milken Institute. Manufacturing 2.0: A More Prosperous California. June 2009. Page 26.

[7] Earliest data available from the Bureau of Economic Analysis is 1963.

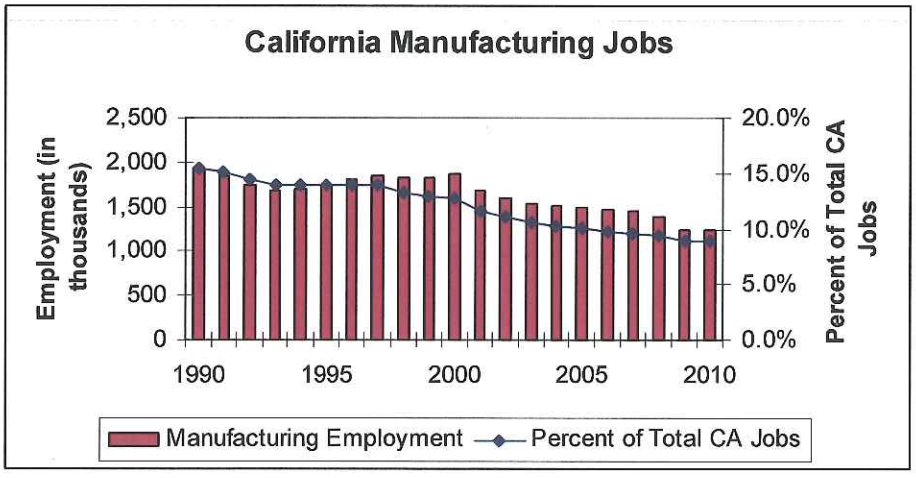
Figure 6: California Manufacturing Output as Share of State GSP



Source: Bureau of Economic Analysis; Economic & Planning Systems, Inc.

Since 1990, manufacturing jobs in California declined by more than 36 percent, for a loss of more than 700,000 jobs. More than 640,000 of those jobs were lost in the past decade alone. At the end of 2009, there were 1.23 million manufacturing jobs in the State, representing 9.0 percent of California's overall non-farm employment. Within California's manufacturing industry, the average annual compensation was $88,000 in 2009, nearly 30 percent higher than the average annual compensation in the rest of the workforce.

Figure 7: California Manufacturing Jobs (1990 to 2010)

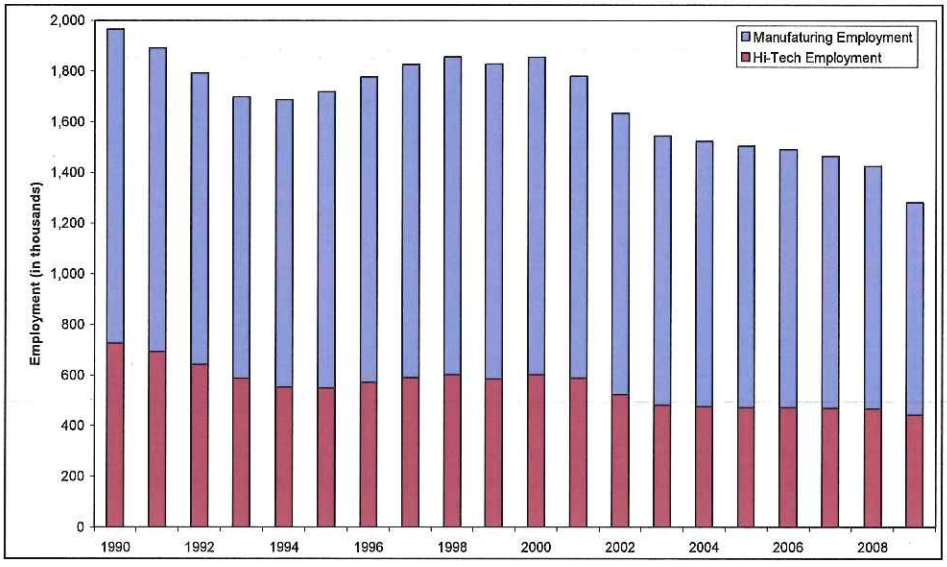


Source: Bureau of Labor Statistics; Economic & Planning Systems, Inc.

The composition of industries within the manufacturing sector is continually evolving as State, national, and global economies change. The State's top ten manufacturing industry sectors (in terms of employment at the four-digit NAICS code level) accounted for 44 percent of State manufacturing jobs in 2007, and six of the ten largest industry sectors (measured by employment) were in relatively high-paying, high value-added, high-tech manufacturing (e.g., IT, aerospace, and biopharmaceuticals).[8, 9]

The State is recognized as a global leader in high-tech innovation and manufacturing. In 2007, the combined output of California's high-tech manufacturing totaled almost $114.8 billion, or 58 percent of the manufacturing sector's total contribution to real gross state product. This level of output represented an increase of 28 percent from 2000 to 2007.[10] Despite this increase in output in the past decade, absolute employment in high-tech manufacturing has declined every year since 2000. Still, high-tech employment as a percentage of total manufacturing employment in California has steadily increased since 2003.

Figure 8: California's Manufacturing and Hi-Tech Employment (1990—2008)



Source: Bureau of Labor Statistics; Economic & Planning Systems, Inc.

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[8] Milken Institute. Manufacturing 2.0: A More Prosperous California. June 2009. Page 43. The six "high-tech" sectors that were in the State's top ten manufacturing industry sectors in 2007 included: (1) semiconductor and other electronic component manufacturing, (2) computer and peripheral equipment manufacturing, (3) printing and related support activities, aerospace product and parts manufacturing, (4) plastics product manufacturing, navigational, measuring, electromedical, and control instruments manufacturing, (5)communications equipment manufacturing, and (6) commercial and service industry machinery manufacturing.

[9] Though the definition of high-tech evolves with every innovation, high-tech typically refers to technology that is the most advanced technology available.

[10] Milken Institute. Manufacturing 2.0: A More Prosperous California. June 2009. Page 28.

California's Largest Manufacturing Industries

The State's largest manufacturing industry in terms of employment and output was the computer and electronic product manufacturing industry, supporting more than 275,000 jobs in 2009 and more than $35 billion of output in 2007. Though this high-tech industry lost more than 100,000 jobs following the dot-com bust and continued to lose jobs through 2009, specific sub-industries, such as the semiconductor and electronic component industry, have posted slow expansions since 2004 because of the State's information technology cluster's ties to manufacturing and research institutions.

The State's second largest manufacturing industry in terms of employment was food manufacturing which supported 11.5 percent of the State's manufacturing jobs in 2009, despite a 7 percent decline since 2001. In the United States, food manufacturing is the largest industry, employing 12.3 percent of manufacturing employees. Chemical manufacturing was the State's second largest contributor to manufacturing output in 2007 and expanded more than 200 percent since 1997 and more than 68 percent since 2000.

The third largest industry in terms of output (in 2007) was the petroleum and coal products manufacturing sector, which generated $18 billion of output, while the third largest industry in terms of employment was fabricated metal product manufacturing.

Food manufacturing was the State's fourth largest industry in terms of manufacturing output, while transportation equipment manufacturing is the fourth largest manufacturing industry in the state in terms of employment. Within the industry, the search and navigation equipment manufacturing sectors, which make products such as radar equipment, aeronautical devices and flight recorders and aerospace manufacturing, are both strong sectors. The aerospace industry employed more than 72,200 workers in 2007. The rate of decline in this subsector has slowed in recent years, in part because the Iraq war has increased demand for aircraft and has helped, at least temporarily, to stabilize the industry.[11]

Tables 3 and 4 present detailed subsector information at the three-digit NAICS code level about employment and output in the State's manufacturing industry.

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[11] Milken Institute. Manufacturing 2.0: A More Prosperous California. June 2009. Page 27.

Table 3
CA Manufacturing Employment
South Fremont/Warm Springs Area Transformational Opportunities; EPS #20050

	Percent of Total Manufacturing Employment (2009)	Rank	Percent Change in Employment (2001 through 2009)	Rank
CA Manufacturing				
Computer and electronic product manufacturing	21.8%	1	-33.7%	11
Food manufacturing	11.5%	2	-7.1%	3
Fabricated metal product manufacturing	9.2%	3	-27.8%	7
Transportation equipment manufacturing	8.8%	4	-21.5%	6
Miscellaneous manufacturing	6.3%	5	-18.7%	5
Chemical manufacturing	6.0%	6	-7.3%	4
Machinery manufacturing	5.4%	7	-33.6%	10
Apparel manufacturing	4.7%	8	-42.6%	17
Printing and related support activities	3.8%	9	-37.0%	15
Plastics and rubber products manufacturing	3.5%	10	-34.9%	14
Beverage and tobacco product manufacturing	3.3%	11	24.2%	1
Furniture and related product manufacturing	2.7%	12	-52.7%	21
Nonmetallic mineral product manufacturing	2.4%	13	-34.6%	13
Electrical equipment and appliance mfg.	2.2%	14	-34.1%	12
Paper manufacturing	1.8%	15	-32.2%	9
Wood product manufacturing	1.8%	16	-47.1%	19
Primary metal manufacturing	1.6%	17	-31.5%	8
Petroleum and coal products manufacturing	1.3%	18	1.4%	2
Textile product mills	0.8%	19	-43.8%	18
Textile mills	0.8%	20	-38.2%	16
Leather and allied product manufacturing	0.3%	21	-48.3%	20

Source: Bureau of Labor Statistics; Economic & Planning Systems, Inc.

Table 4
CA Manufacturing Output
South Fremont/Warm Springs Area Transformational Opportunities; EPS #20050

	Percent of Total Manufacturing Output (2007)	Rank	Percent Change in Output (1997 through 2007)	Rank
CA Manufacturing				
Computer and electronic product manufacturing	20.2%	1	-10.5%	19
Chemical manufacturing	12.8%	2	205.3%	1
Petroleum and coal products manufacturing	10.2%	3	165.4%	2
Food product manufacturing	10.0%	4	46.2%	4
Miscellaneous manufacturing	7.2%	5	80.6%	3
Fabricated metal product manufacturing	7.0%	6	24.7%	9
Other transportation equipment manufacturing	7.0%	7	42.3%	5
Machinery manufacturing	4.8%	8	16.7%	12
Apparel manufacturing	2.7%	9	14.3%	13
Plastics and rubber products manufacturing	2.7%	10	5.7%	16
Nonmetallic mineral product manufacturing	2.6%	11	41.4%	6
Printing and related support activities	2.4%	12	-9.0%	17
Electrical equipment and appliance manufacturing	2.1%	13	19.7%	10
Furniture and related product manufacturing	2.0%	14	26.3%	8
Primary metal manufacturing	1.6%	15	33.2%	7
Paper manufacturing	1.5%	16	6.3%	15
Motor vehicle, body, trailer, and parts manufacturing	1.4%	17	18.3%	11
Wood product manufacturing	1.1%	18	-9.3%	18
Textile and textile product mills	0.7%	19	9.4%	14

Source: Bureau of Economic Analysis; Economic & Planning Systems, Inc.

California Industries Gaining Jobs

Drilling down to the four-digit NAICS code level, a recent trend emerges in the State's manufacturing sector—an expansion of industries that serve consumer markets, such as the beverage manufacturing industry, pharmaceutical and medicine manufacturing, and other food manufacturing.[12] Pharmaceutical and medicine manufacturing, for example, supported more than 44,300 manufacturing jobs in 2007. This high-tech industry has added 6,400 jobs since 2000, an increase of 17 percent, and more than 21,100 jobs since 1990. The average wage was $102,200, a 44 percent increase since 2000.

California Industries Losing Jobs

The State's declining industries include cut and sew apparel manufacturing, computer and electrical product manufacturing, and the printing industry.

- Cut and sew apparel manufacturing was once the fourth-largest manufacturing employer in California, but since 2000, the industry has shed more than 45,000 jobs. The computer and electrical product industry once had the biggest share—21 percent—of manufacturing jobs in the State. However, this industry suffered greatly from the tech bubble's collapse in 2000, when more than 115,000 jobs disappeared.
- The printing industry is suffering as digital media is growing. The industry employed more than 58,300 workers in 2007, having shed 23,500 positions since 2000, a decrease of 29 percent. The average wage was $45,600 in 2007, a 16 percent increase since 2000.

Regional

Within California, there are regional concentrations and clusters. On a very broad level, Los Angeles is focused on aerospace, San Diego has pursued biotechnology, and the San Francisco Bay Area has biotech and information technology clusters. The San Francisco Bay Area comprises nine counties and is home to approximately 7.5 million people. The region functions as an integrated economy that has strong connections to numerous other geographies including the Central Valley and the Pacific Rim. Within the Bay Area, there are a diverse range of industry sectors spread throughout the region with core job concentrations in San Francisco, Silicon Valley, the I-80/880 Corridor, the Tri-Valley, and locations within the North Bay. The City of Fremont is influenced by and falls within two job centers, Silicon Valley (that includes San Mateo County, Santa Clara County, southern Alameda County, and northern Santa Cruz County) and the I-80/880 Corridor (that includes cities from Richmond in the north to Fremont in the south and occupies the western portion of Alameda and Contra Costa counties). This section focuses on the subregion of the San Francisco Bay Area that surrounds the City of Fremont, including the counties of Alameda, San Mateo and Santa Clara, that together capture most of Silicon Valley and the I-80/880 Corridor.

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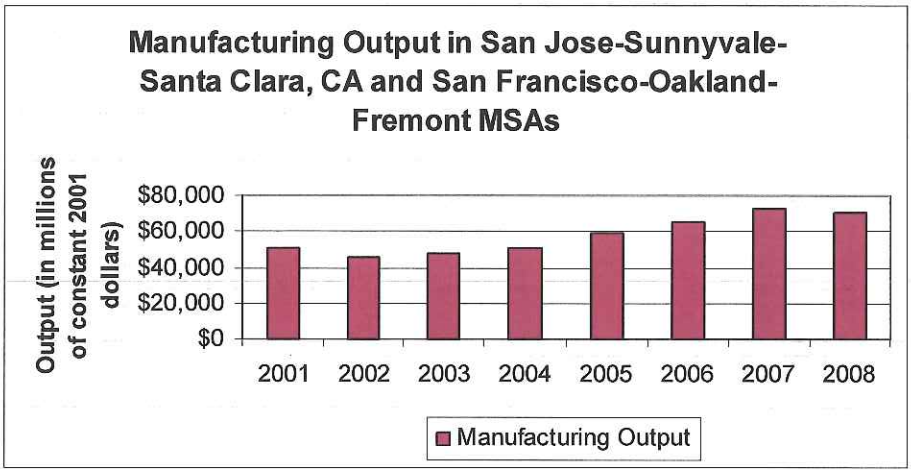
[12] Other food manufacturing includes coffee and tea, snacks, mixes, spices, condiments, prepared meals, and specialty ethnic foods.

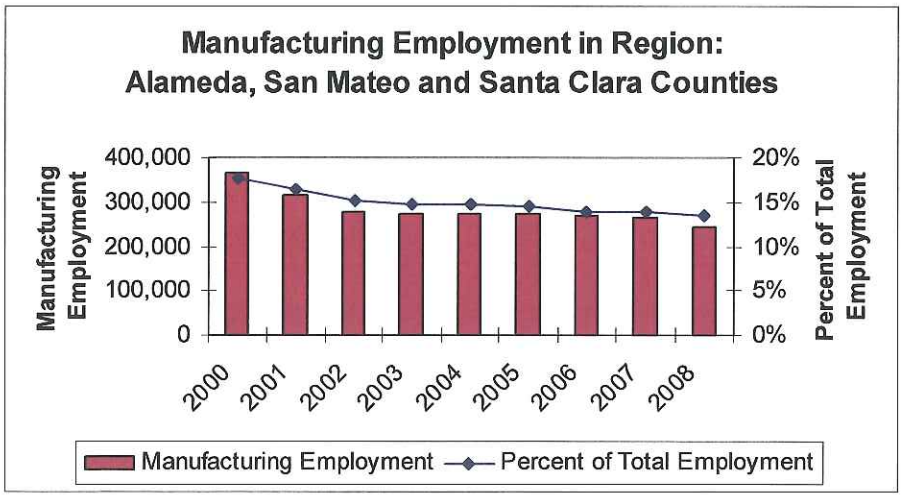
Figure 9: Manufacturing Output in Region (2001—2008)



Source: Bureau of Economic Analysis

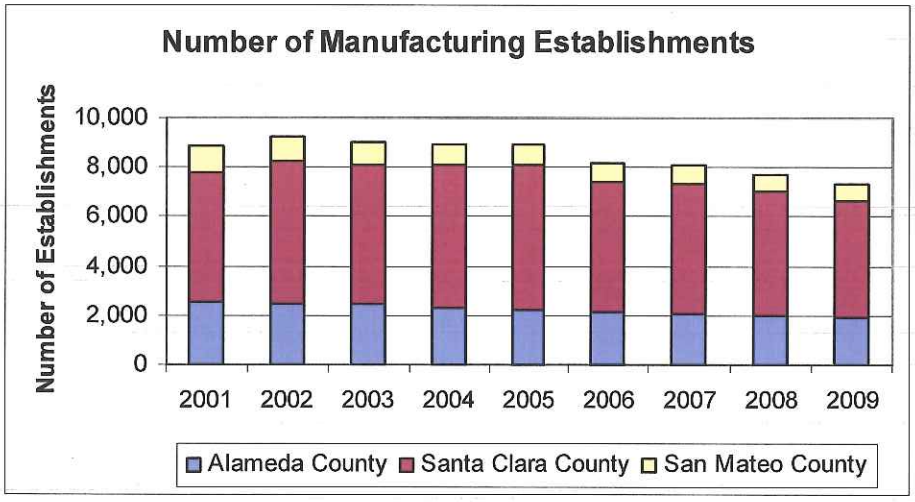
Between 2001 and 2008, subregional manufacturing output increased by 39 percent in real terms (4.8 percent annually), with the period of significant growth occurring between 2002 and 2007 (58 percent), consistent with overall economic growth in the United States. As in previous periods, however, this increased overall manufacturing production did not help generate jobs in the region. Between 2001 and 2009, manufacturing employment in the subregion declined 33 percent and now stands at about 245,000 jobs, 13.5 percent of total subregional employment. In 2001, manufacturing represented nearly 18 percent of total employment (see **Figure 10**). Employment was flat during the period of general economic expansion in the United States (2002 to 2007), but declined dramatically during the 2000-2001 recession and the Great Recession and its aftermath. At the same time, the number of private sector manufacturing businesses has fallen each year since 2002 with 17 percent fewer establishments in 2009 than in 2001 (see **Figure 11**). The pace of decline became more rapid after 2005.

Figure 10: Regional Manufacturing Employment (2000—2008)



Source: Bureau of Labor Statistics; Economic & Planning Systems, Inc.

Figure 11: Number of Manufacturing Establishments (2001—2009)



Source: Bureau of Labor Statistics; Economic & Planning Systems, Inc.

Comparing the tri-county subregion to the whole of the State and nation illustrates the more significant role of manufacturing in the subregion (see **Table 5**). At 13.5 percent, the subregion's concentration of manufacturing employment is about 50 percent higher than for both the State and the nation. Because of the higher concentration in high-value manufacturing and the associated worker productivity, the manufacturing sector's 17.5 percent contribution to subregional output is 65 to 70 percent higher than for both the State and the nation. Though recent manufacturing job losses in the region have been more severe proportionally than at the U.S. and State levels, the region's output has expanded significantly since 2001 compared with output declines in the State and nation. This expansion was primarily driven by growing output in the computer and electronic manufacturing.

Table 5: Comparisons of Manufacturing Employment and Output

Geography	Manufacturing Employment as a share of Total Employment	Percent Change in Manufacturing Employment	Manufacturing Output as a share of Total Output	Percent Change in Manufacturing Output Since 2001
United States	9.3% [1]	-18.4% [6]	11.1% [1]	3.7% [4]
California	8.9% [1]	-18.3% [4]	9.8% [2]	-2.3% [4]
Region [3]	13.5% [1]	-27.0% [4]	17.2% [2]	38.7% [4]

[1] As of 2009.
[2] As of 2008.
[3] Defined as San Jose-Sunnyvale-Santa Clara, CA and San Francisco-Oakland-Fremont MSAs
[4] 2001 through 2008.

Source: Bureau of Labor Statistics; Bureau of Economic Analysis; Economic & Planning Systems, Inc.

As shown on **Table 6**, the largest manufacturing industry in the subregion is Computer and Electronic Product manufacturing, which represents 53 percent of manufacturing jobs in 2009, despite losing 38 percent of its 2001 job base. This subsector concentration is very high compared with shares of 21.8 and 12.3 percent in California and the United States, respectively. Only two manufacturing industries added jobs between 2001 and 2009: Beverage and Tobacco Product Manufacturing expanded by 6 percent and Chemical Manufacturing grew by 10 percent. All other industries declined, with Apparel manufacturing and Leather and Allied Product manufacturing each losing approximately 70 percent of their 2001 jobs. Transportation Equipment manufacturing shed 55 percent of its 2001 job base.

Table 6
Regional Manufacturing Employment
South Fremont/Warm Springs Area Transformational Opportunities; EPS #20050

	Percent of Total Manufacturing Employment (2009)	Rank	Percent Change in Employment (2001 through 2009)	Rank
Regional Manufacturing				
Computer and electronic product manufacturing	52.6%	1	-37.5%	11
Chemical manufacturing	6.9%	2	10.0%	1
Fabricated metal product manufacturing	5.7%	3	-41.0%	14
Machinery manufacturing	5.5%	4	-51.4%	18
Food manufacturing	5.3%	5	-13.7%	5
Miscellaneous manufacturing	4.6%	6	-8.5%	3
Transportation equipment manufacturing	3.0%	7	-55.1%	19
Printing and related support activities	1.9%	8	-51.1%	17
Electrical equipment and appliance mfg.	1.8%	9	-32.6%	9
Nonmetallic mineral product manufacturing	1.5%	10	-38.7%	12
Paper manufacturing	1.2%	11	-39.4%	13
Beverage and tobacco product manufacturing	1.2%	12	6.0%	2
Plastics and rubber products manufacturing	1.1%	13	-50.1%	16
Furniture and related product manufacturing	1.0%	14	-48.7%	15
Primary metal manufacturing	0.8%	15	-21.2%	6
Wood product manufacturing	0.4%	16	-31.3%	7
Apparel manufacturing	0.3%	17	-68.9%	20
Textile product mills	0.2%	18	-31.4%	8
Petroleum and coal products manufacturing	0.1%	19	-32.9%	10
Textile mills	0.0%	20	-12.2%	4
Leather and allied product manufacturing	0.0%	21	-70.2%	21

Source: Bureau of Labor Statistics; Economic & Planning Systems, Inc.

V. KEY FACTORS SHAPING INDUSTRIAL PRODUCTION

There are a myriad of factors that have influenced and will continue to influence the scale, composition, location, and sustainability of U.S. industrial production. Primary factors include: (1) technological advancement and manufacturing productivity; (2) cost differentials, international trade, and the globalization of production; (3) science, technology, innovation, and education. In many ways, the U.S., State-level, and/or regional response to the increased opportunities and competition posed by these forces—whether through policy, education, or investment in basic research—will define the opportunities for the future.

Productivity Increases

Since well before international trade emerged as a key factor, technological advancement has been increasing manufacturing productivity and affecting the number and type of jobs supported by the manufacturing sector. Technological advancement and the automation that often goes with it have reduced the number of workers required to support a particular level of output. The faster pace of productivity increase in the U.S. manufacturing sector relative to other sectors has reduced costs and reduced the level of consumer expenditure required to obtain the same set of goods. This is one reason, in addition to the increasing focus by U.S. consumers on "quality of life" services such as healthcare, recreation, and travel, that U.S. residents are spending increasingly less on goods. For example, in 1970, U.S. residents spent 46 percent of their outlays on goods (manufacturing, agriculture, and mining) and 54 percent on services and construction. Today, U.S. residents spend 34 percent on goods and 66 percent on services.[13]

Increases in manufacturing productivity have surpassed productivity gains in other U.S. sectors. For example, from 1977 to 2002, productivity in the overall economy increased 53 percent, while manufacturing productivity rose 109 percent.[14] In a comparison with 14 other industrialized or newly industrialized countries, growth in U.S. manufacturing productivity was greater than that of all but two of those countries.[15] The Bureau of Labor Statistics tracks worker productivity, which is measured as the ratio between economic output and number of employees. Worker productivity has increased steadily since 1970 (when the index began) and began to increase much more rapidly in the 1990s. From 1990 to 2009, manufacturing value-added output increased 22 percent while the number of jobs declined 21 percent.

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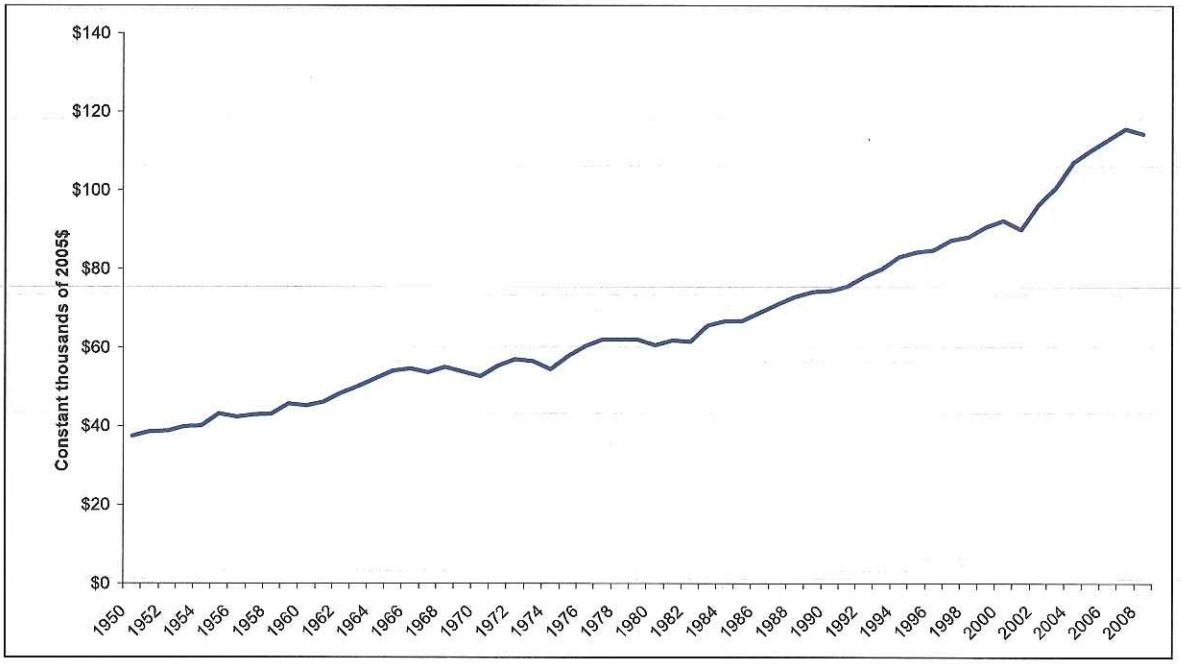
[13] Bureau of Economic Analysis, 2009.

[14] U.S. Department of Commerce. Manufacturing in America: A Comprehensive Strategy to Address the Challenges to U.S. Manufacturers.

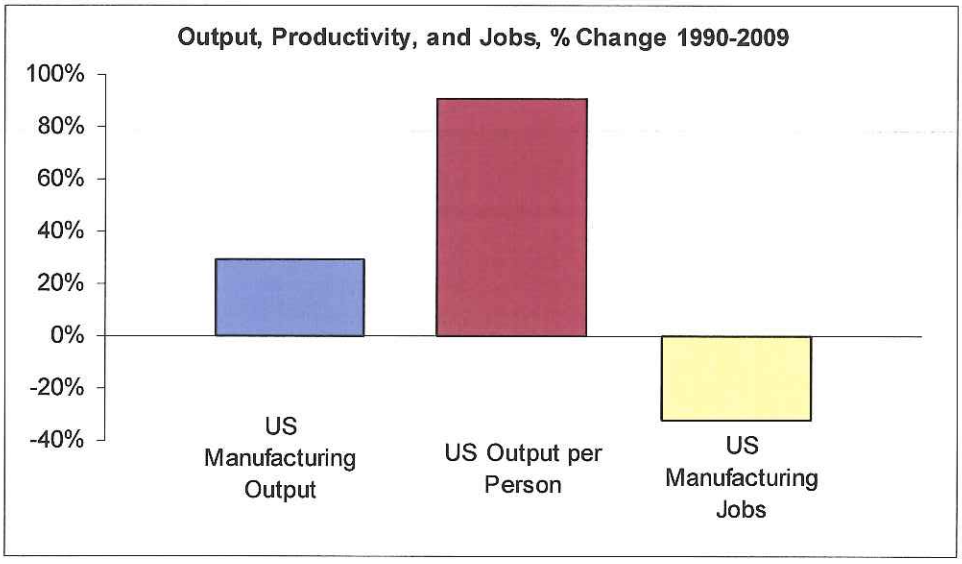
[15] Milken Institute. Manufacturing 2.0: A More Prosperous California. June 2009.

Figure 12: Manufacturing Value-Added per Employee



Source: Bureau of Economic Analysis

Figure 13: U.S. Output, Productivity and Jobs, Percent Change (1990 through 2009)



Source: Bureau of Labor Statistics

Globalization/International Trade

Reductions in trade barriers, improvements in transportation infrastructure and logistics, and the increasing availability of information have resulted in increasing levels of international trade and competition. U.S. exports and imports have increased significantly and goods and services are exchanged across international boundaries with increasing frequency.

U.S. businesses have found new markets for their products, services, and technologies as well as improved access to supplies and technologies from abroad. U.S. consumers have been presented with a broader range of goods, whether cheaper products resulting from lower production costs in developing and emerging markets or alternative options because of successful product development in other advanced nations. Many U.S. businesses are becoming increasingly multinational in nature with the "offshoring" of a range of functions. Many U.S. firms find the greatest efficiency in stationing primary management, research and development functions in the United States and production overseas—for example, Apple employs approximately 25,000 persons in the United States to work on Apple products, while about 250,000 workers are employed in the manufacturing of Apple products in China.[16] And, firms seeking to sell in other countries have found benefit in establishing a presence in major markets, whether to enhance acceptability, avoid trade barriers, or to improve efficiency (e.g., foreign car manufacturers in the United States or U.S. firms in China).

Trade Levels and Imbalances

In 2008, U.S. exports of goods and services were about $1.8 trillion, about 13 percent of overall U.S. GDP. Imports of goods and services stood at about $2.5 trillion, for a net trade deficit of $700 billion, about 5 percent of U.S. GDP. The current trade deficit is driven by goods trading—the United States maintained a surplus in its service trade balance of $135 billion in 2008.

In 2008, U.S. exports of goods were valued at $1.3 trillion, about 70 percent of total U.S. exports and about 78 percent of U.S. manufacturing value-added GDP. With imports at $2.1 trillion that year, the imbalance in the trade of goods was $835 billion, about 50 percent of U.S. manufacturing value-added GDP, and 5.8 percent of U.S. GDP (about 40 percent of these goods are imported by U.S. businesses as inputs into by U.S. industrial production). While trade deficits in manufacturing goods have been a common concern for U.S. policymakers since 1970, as of 1990 the manufacturing goods trade deficit represented a relatively modest 11.7 percent of manufacturing value-added GDP and 1.9 percent of overall U.S. GDP. However, since the mid-1990s and, in large part as a result of trade with China, the manufacturing goods trade deficit exploded (see **Figure 14**).

In August 2010, the U.S. international trade deficit in goods and services was $46.3 billion, the difference between $200 billion in imports and $154 billion in exports.[17] Imports of goods from China (primarily toys, games, and sporting goods; household goods; and computer accessories) represented $35.3 billion or 17.5 percent of imports in August 2010. The goods deficit with

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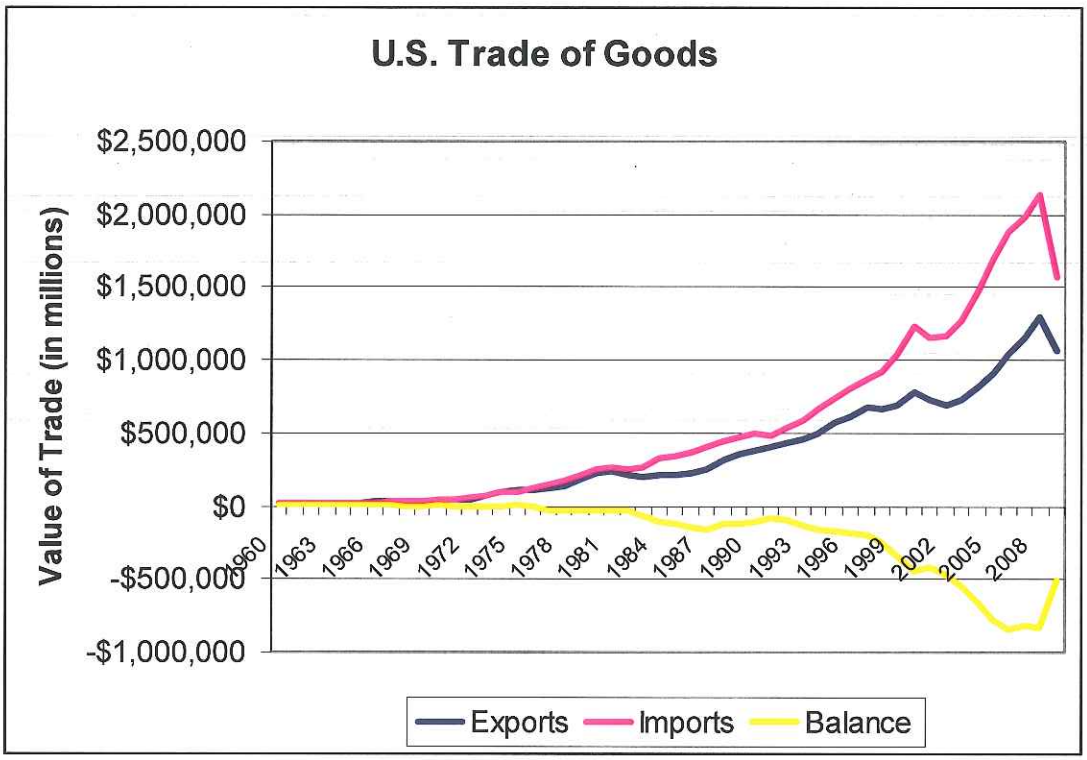
[16] Grove, Andy. How to Make an American Job Before It's Too Late. Bloomberg Opinion. July 1, 2010.

[17] U.S. Census Bureau. October 14, 2010.

China was $28.0 billion, about 60 percent of the total trade deficit, because of the modest exports of U.S. goods, about $7.3 billion (primarily civilian aircraft, engines, equipment, and parts).[18]

Figure 14: U.S. Trade Balance, Goods (1960—2009) (nominal dollars)



Source: Bureau of Economic Analysis

Policy Issues

Many economists consider international trade an important source of economic growth, a spur for technological advancement and increasing productivity, and an appropriate way to drive economic development in areas of comparative advantage. The combination of the depth and longevity of the current downturn, worsening trade deficits over the last 15 years, and policy interventions by numerous countries have refocused debate in the United States around industrial policy and intervention and the need for tougher action against competitors considered to be engaged in unfair trade practices.

Significantly lower costs/prices drive the importing of many goods and services into the United States. While many of the reasons for these cost differentials are unlikely to change significantly in the short to medium term—e.g., production costs associated with labor, health and safety, and environment regulations—other cost issues have come under increasing scrutiny. Of particular concern is China's exchange rate policy and its unwillingness to let the yuan rise against the

[18] U.S. Census Bureau. October 14, 2010.

dollar to help offset the growing trade imbalance. This currency control all but assures the continuation of trade imbalances between the United States and China, with the price of importing China's industrial production kept artificially low.

Also of concern to many business groups are a number of tax and regulatory policies that may limit the incentive for multinationals to reinvest revenues back in the United States. For example, a recent policy paper issued by the Silicon Valley Leadership Group recommended lowering the corporate tax rate and crafting policies to ensure foreign earnings are repatriated.[19] And finally, there are ongoing debates about the appropriateness, importance, and effectiveness of public subsidies. Many countries look to support and, in some case, protect particular industries, occasionally in potential conflict with international trade agreements - for example, China's subsidies to its clean-energy industry are currently in the spotlight. As discussed further below, whether public subsidy is best focused on education, research institutions, technology-supporting infrastructure, and/or investments into particular businesses is an open question.

Beyond these international trade factors, there are a number of other policy and economic factors that will influence the scale of industrial production in the United States including intellectual property protection concerns and transportation and other costs. In particular, relatively strong intellectual property protection provided under U.S. law makes it an attractive location for R&D off-shoring from other countries. It also a common reason cited for returning production operations to the United States. The stability of the U.S. legal framework and laws provide a level of certainty and stability not typical in emerging markets. Additionally, rising transportation costs can have a major impact on the cost of imports, and increasing environmental concerns about the carbon footprint associated with shipping goods from overseas could affect long-term demand. To the extent that these factors are enough to override cheaper overseas production costs, there can be a future for manufacturing in the United States.

Intranational Competition

As a global leader in high-technology research, development, and production, California, and the San Francisco Bay Area in particular, attract smart, ambitious entrepreneurs, scientists, and researchers who want to be a part of the State's innovation ecosystem. They seek access to academic institutions, national labs, and venture capital funding, as well as proximity to other like-minded people. At the same time, some view California and the San Francisco Bay Area as difficult places for business with high taxes, high real estate costs, significant environmental regulatory requirements, and high labor costs. The Milken Institute analyzed manufacturing jobs in California relative to manufacturing jobs in California's peer states (Arizona, Indiana, Kansas, Minnesota, Oregon, Texas, and Washington) and found that these states were able to turn around their manufacturing employment declines through targeted economic development strategies, with outreach and incentives often aimed at California firms.[20] While California and its core innovation regions, like the San Francisco Bay Area, may not be able to compete on cost

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[19] Policy Recommendations to Create U.S. Manufacturing Jobs. Silicon Valley Leadership Group. September 2010.

[20] Targeted economic development strategies included work force development, improvements to the business climate, improving access to capital, and investing in innovation.

with many other U.S. regions, a continued pre-eminence in combining university, federal, and industrial research and development, technology commercialization and innovation, and a talented workforce will be the key to ongoing success both internationally and intra-nationally.

Science, Technology, and Innovation

The logical response to increasing international trade competition, especially from countries offering significantly lower labor costs, is for the United States to focus on "high value" production requiring a more skilled and innovative workforce. A core area of undoubted U.S. strength is its R&D. By most measures—Nobel prizes, patents of significance, royalties and licensing fees, the quantity of publications and their quality as evidenced by the number of citations—the United States is at the forefront of innovation.[21] U.S. research universities, national labs, and nonprofit research institutes have long driven advancements in basic and applied science with increasing rates of technology transfer and commercialization, increasing numbers of research partnerships between industry and government, and increasing levels of R&D investment by industry.

Innovation Activity

Innovation regions throughout the United States—often "co-located" regionally with academic, federal, and nonprofit—have taken advantage of these research efforts and led numerous waves of innovation through overlapping formal and informal relationships between universities, established companies, and start-ups. The San Francisco Bay Area and Silicon Valley, in particular, stands out as global and nation leader in R&D. Silicon Valley's percentages of total California and U.S. patent registrations have continued to grow over the last decade, if at a slower rate than in the 1990s. In 2007, patents registered by primary inventors located in Silicon Valley represented 50 percent of all patents registered in California and 12 percent of all registrations with the U.S. Patent and Trade Office. Silicon Valley cities make up half of the top ten cities in the United States for patent registrations. While total patents slowed slightly, the Valley actually increased its contributing share of California and U.S. patents. Additionally, the region accounts for a growing percentage of U.S. green technology patent registrations.

Financing

The United States' well-developed system of venture capital financing has long helped support U.S. development and commercialization of technologies. With the period in technology development between the basic research of academic/federal research institutions and actual commercialization by industry often referred to as the "valley of death" because of a lack of financing invested at this stage, venture capital plays a critical role in technology commercialization. Venture capital funding has been a major source of support for California's growing industries. Funding has increased steadily, but slowly, after falling from $43 billion to $9 billion in the dot-com crash. New funding is concentrated in biotech, green tech, software

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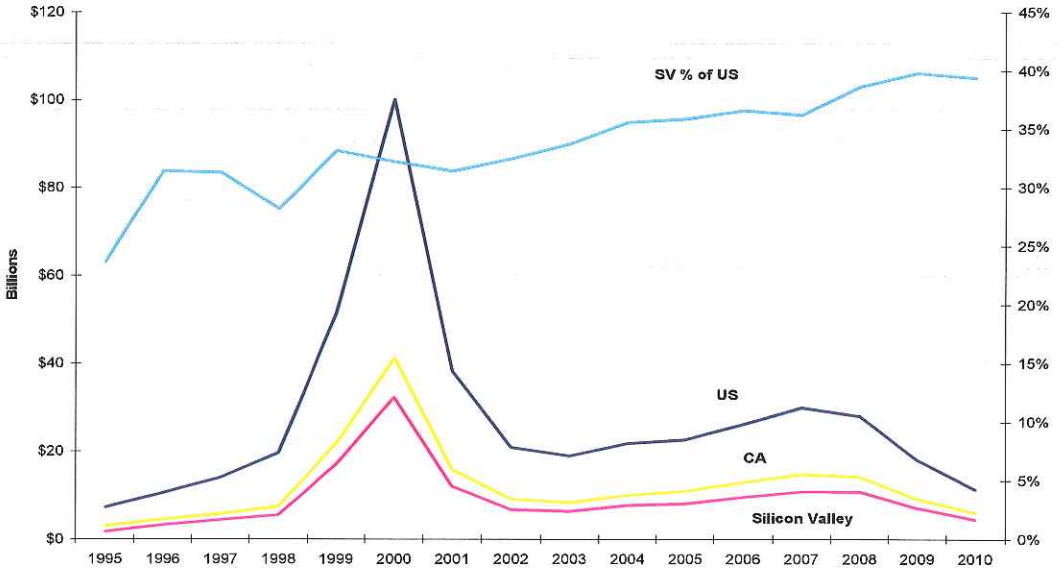
[21] Van Noorden, Richard. Building the Best Cities for Science. Nature. Volume 467. October 2010.

and other services.[22] California's share of U.S. venture capital formation, another measure of location decisions and competitiveness, has been in a steady upturn. California's share recently hit an all-time record level of near 50 percent of total U.S. venture capital funding.

In Silicon Valley (defined as San Mateo and Santa Clara counties by the Joint Venture: Silicon Valley Network's annual Index report), venture capital investment in 2008 was down for the first time since 2005 in the region and nationally, but the Valley maintained its 29 percent national share of venture capital in 2008.

Figure 15: Venture Capital Investment



Sources: PricewaterhouseCoopers National Venture Capital Association Money Tree Report

New Challenges

Even the current U.S. pre-eminence in science, technology, and innovation is starting to face growing concerns. The ability of the United States to invest in education—especially public education—at all levels is diminishing, potentially weakening one of the United States' foundational strengths. Concerns over national security are diminishing the ability of universities and business to attract the top minds from other countries. Federal investment in research has been flat for a long time, though this has been countered, in some measure, by industrial investment. Other countries that are capturing an increasing share of global manufacturing are also eyeing higher-value functions as their labor force becomes more skilled and new industries emerge.

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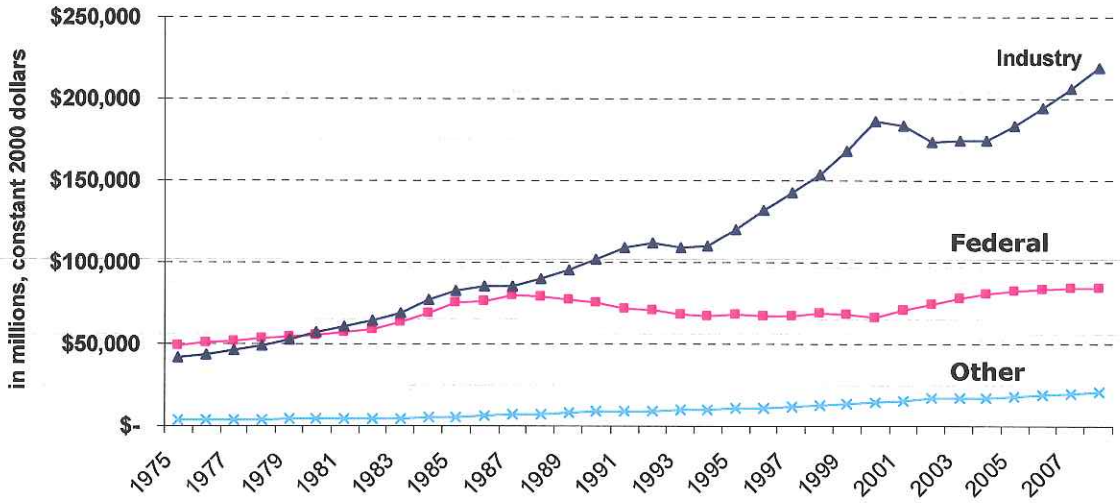
[22] Levy, Stephen. California's Future Economy and Population: Implications for a Fiscal Policy Agenda. Center for Continuing Study of the California Economy. February 2009.

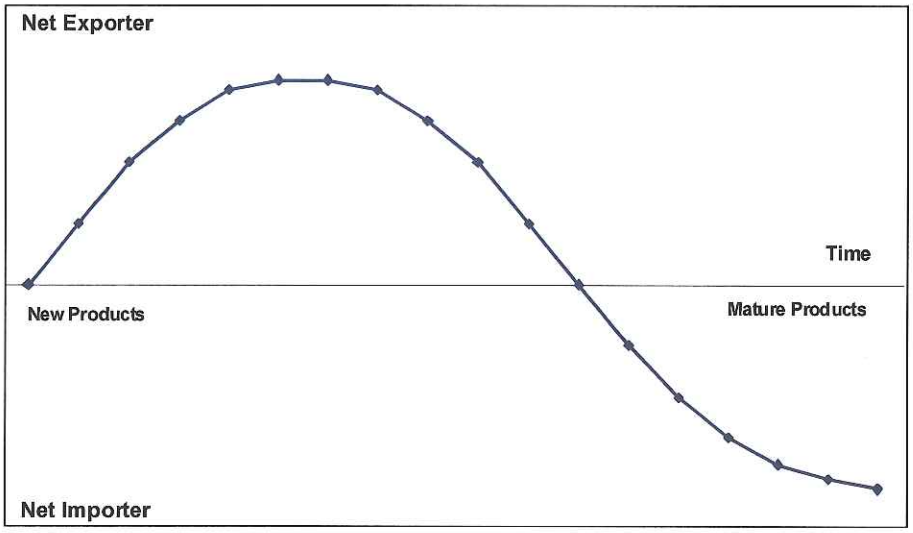
Figure 16: U.S. R&D Spending by Source (1975 to 2008)



SOURCES: National Science Foundation, Division of Science Resources Statistics (NSF/SRS), Research and Development in Industry 2007; Academic Research and Development Expenditures: FY 2008; Federal Funds for Research and Development: FY 2007–09; and Research and Development Funding and Performance by Nonprofit Organizations: FY 1996–97. All NSF/SRS reports available at http:/www.nsf.gov/statistics/

The historical pattern of the United States' experience with new technologies over time shows a strong trade surplus in the early years of a technology's discovery and development, as illustrated below (see **Figure 17**). Over time, as the technology matures, its production becomes more distributed and the United States transitions from being a net exporter of the technology to being a net importer, resulting in a turnaround of the trade balance.

Figure 17: U.S. Experience with New Technologies



Source: Unknown

However, with ongoing off-shoring of production, the longevity of the expected trade surplus may be starting to diminish. Furthermore, the cleantech sector, for example, an emerging new technology sector that would typically be expected to be primarily researched, developed, and produced in industrialized nations, may defy this paradigm. China, for example, already has more than one million jobs in the cleantech sector and is now the largest competitor for U.S. cleantech manufacturers. [23] And, as mentioned previously, the Chinese clean-energy industry (solar and wind) is heavily subsidized and supported by the government through free (or cheap) land, low interest loans, and government assumption of loan interest payments as well as expedited factory permitting and construction.[24]

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[23] Bradsher, Keith. On Clean Energy, China Skirts Rules. The New York Times. September 8, 2010.

[24] Bradsher, Keith. On Clean Energy, China Skirts Rules. The New York Times. September 8, 2010.

VI. Promising Industrial Sectors

Whether or not R&D and manufacturing remain feasible uses for the South Fremont/Warm Springs Study Area will depend in part on the outlook for promising industrial sectors in the coming decades in the context of the factors described in the previous section. Despite very significant job losses in manufacturing, the industry remains one of the nation's largest and strongest economic engines. The future of R&D and manufacturing will depend a great deal on economic development and fiscal policies to enhance competitiveness enacted at the national and State levels. Promising industrial sectors to monitor include:

- Electric Vehicle Industry
- High-Tech and Information Technology
- Clean and Green Technology
- Biotechnology
- Logistics/Warehousing
- High-Speed Rail

Electric Vehicle Industry

Defining the Cluster

"Electric vehicle industry" refers to the developers and manufacturers of electric vehicle technologies, components, and vehicles. The electric vehicle industry is a sub-category of the "Clean and Green Technology" industry since the electricity used to power these vehicles can theoretically be generated by renewable and low-carbon footprint energy sources. A number of start-up and entrepreneurial ventures have entered the electric vehicle industry since the world's major automobile manufacturing companies long ignored the technology. Electric vehicle technology development is focused on extending battery life and decreasing charging times without sacrificing performance and comfort, thus requiring development of new battery technology, regenerative braking systems, lightweight components, aerodynamic designs, higher-efficiency electronics and climate controls, infrastructure for recharging, etc.

Overview of Global and National Existing Conditions and Trends

Electric vehicles have become a niche for entrepreneurial innovation since major automobile manufacturers largely ignored all-electric vehicles and chose to focus on hybrids, hydrogen fuel-cell development, and alternative fuels. Tesla Motors paved the way for electric vehicle start-ups, based on the realization that in-house research and development costs were lower than perceived because of battery technology and efficiency improvements pioneered by consumer electronics companies. Tesla Motors was financed in the manner of a typical Silicon Valley startup, with angel investment by now-CEO Elon Musk, followed by venture capital investment

and a stock offering.[25] The government has also provided significant support, including a $465 million loan in 2009 through the Advanced Technologies Vehicle Manufacturing Loan Program.[26]

The current U.S. electric vehicle industry is split between large, traditional manufacturers and small start-ups. There are three significant start-ups planning or producing production vehicles in the United States:

- Tesla Motors: Tesla is the best-capitalized and developed start-up. The company is headquartered in Palo Alto, has a design facility in Hawthorne (Southern California), and in 2010 purchased the NUMMI plant. The company has been selling its high-end Roadster model in modest quantities since 2008, but is gearing up to produce the Model S sedan at the former NUMMI plant in 2012. Tesla also has battery and drive train technology sales or production agreements with Daimler and Toyota. Daimler, Toyota, and Panasonic are major partners with the company.

- CODA Automotive: CODA is a privately-held company headquartered in Santa Monica, California. The company produces electric vehicle battery technology specializing in thermal management, and was scheduled to release its first vehicle—the CODA Sedan—in late 2010. The vehicle was developed cheaply by modifying an existing Chinese-produced sedan. CODA plans to open a joint-venture battery production facility in Columbus, Ohio. As of October 2010, the company was negotiating with Amports to perform final CODA Sedan assembly in Benicia, California (with the bodies and interiors shipped in from China).[27] CODA has received more than $125 million in private investment.[28]

- Fisker Automotive: Fisker is a privately-held company based in Irvine, California. The company plans to debut its plug-in hybrid Karma sports car in late 2011. While the Karma will be manufactured in Helsinki, Finland, Fisker has also agreed to acquire a former GM plant in Wilmington, Delaware, to produce the Project NINA plug-in hybrid sedan. Fisker has agreed to acquire the plant for $20 million and will spend approximately $125 million to prepare it for production. The company received $528.7 million in ATVM loans for this purpose.[29] Fisker has also received over $300 million in private investment.[30]

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[25] Davis, Joshua. "How Elon Musk Turned Tesla into the Car Company of the Future." *Wired.* 27 September 2010.

[26] Department of Energy. Website. Accessed 1 November 2010.

[27] Motavalli, Jim. "Enterprise to Rent CODA Electric Cars." *The New York Times.* Wheels Blog. 14 October 2010.

[28] CODA. "Battery System and Electric Car Manufacturer CODA Closes Oversubscribed Series C Investment Round." Press Release. 19 May 2010.

[29] Department of Energy.

[30] Volpe, Michael. "Fisker Hiring for Karma, Other Cars." *Orange County Business Journal.* 17 October 2010.

Established manufacturers planning electric vehicle releases include GM, Nissan, Daimler, Ford, Mitsubishi, Volkswagen, Fiat, Honda, and Toyota. Of these, GM and Nissan will be first to the mass market in late-2010. A number of small electric vehicle manufacturers exist worldwide, but many are producing unusual or very small vehicles unlikely to capture widespread market attention. However, widespread government investment is driving increased global competition. Electric vehicle research has also generated several battery technology start-ups.

Government incentives and regulations play a major role in driving the electric vehicle industry. Several Federal measures help develop technology to supply viable electric vehicles; for example, the ATVM program has provided nearly $8.3 billion in loans to four manufacturers for final engineering and manufacturing facilities.[31] The American Reinvestment and Recovery Act included $2.4 billion in grants for electric vehicles. Other grant programs promote development of electric charging infrastructure and related technology research. On the consumer end, demand is bolstered by up to $7,500 in Federal tax credits and various state-offered credits for electric vehicle purchases. Government investment and incentive programs now exist in most developed nations with potential to compete in the electric vehicle arena.

The long-term outlook for electric vehicles is unclear. As shown above, most major manufacturers plan to release electric vehicles, and the government is providing generous subsidies. However, a number of variables are still uncertain, including market popularity, electrical grid capacity, actual operations cost savings, ability to reduce price at increased scale, vehicle performance in challenging conditions, actual emissions reductions, and development of infrastructure for recharging away from home.

As with any new technology, industry success would likely result in a period of instability as start-ups are acquired by major manufacturers, license their technology, or are driven out of business. Most electric cars targeted to Americans are now being manufactured in the United States; this may change if restrictive trade regulations are loosened by other countries.[32]

Bay Area Positioning

The Bay Area has taken an early and highly-promising lead in electric vehicle start-ups because of the presence of Tesla Motors and large quantities of venture capital. CODA's potential plant in Benicia—though temporary until a Southern California plant can be built—will further boost the Bay Area's electric car manufacturing prowess. The Bay Area may ultimately play a niche role in the electric vehicle industry, focused on development of technology and start-ups, with manufacturing contained to the new start-ups. No major established automobile company manufactures cars in the Bay Area; such manufacturers tend to locate new domestic plants in the southern United States. Southern California leads in vehicle design and domestic headquarters for foreign automobile manufacturers.

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[31] Department of Energy.

[32] Rahim, Saqib. "Can America Lead the Global Electric Car Industry?" *Scientific American.* 28 September 2010.

Site-Specific/Fremont Implications

Tesla Motors now owns the former NUMMI plant, where it plans to produce the Model S in 2012 and potentially other products; the factory may function as a seed to grow electric vehicle-related manufacturing and development facilities nearby. Assuming Tesla is successful, the company will likely expand dramatically within the facility over time based on contracts for battery, drive-train, and/or vehicle production. Tesla's research and development facility is still located in Palo Alto, but a shift to the Fremont factory could drive additional research facilities to locate nearby.

High-Tech and Information Technology

Defining the Cluster

The high-tech and information technology industry comprises industries that deal with the use of computers and telecommunications to convert, process, retrieve, store and transmit information[33]. More specifically it includes industries such as computer systems design, computer and electronic products, software publishers, telecommunications, semiconductors, and networking and information technology services.

Overview of Global and National Existing Conditions and Trends

A recent report on information technology by the World Economic Forum and INSEAD points out that the industry has become increasingly important for the global economy. It accounts for approximately 5 percent of GDP growth between 2003 and 2008.[34] The information technology industry has continuing potential to increase efficiency and sustainability world-wide given its applicability to the enhancement of existing systems.

The information technology industry has a particular ability to help cites and nations achieve sustainability and carbon reduction goals. Using information technology can reduce energy consumption through the implementation of smart buildings, smart grids, reduced travel, and improved energy efficiency.[35] Statewide high tech employment continues to be a key part of economic growth. High-tech employment as a percentage of total manufacturing employment in California has increased since 2003.[36]

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[33] Information Technology Association of America. http:/www.itaa.org/

[34] Dutta, Soumita (INSEAD) and Irene Mia (World Economic Forum). The Global Information Technology Report 2009–2010: ICT for Sustainability. 2010.

[35] GBS Bindra. How Technology Will Drive the Transition to the Low-Carbon Economy: ICT and the Sustainability Imperative.

[36] Bureau of Labor Statistics.

Bay Area Positioning

There are approximately 5.8 million high tech workers in the United States[37]. The Bay Area continues to hold onto and grow its reputation as the leading information technology region in the United States. According to a 2008 report by the American Electronics Association, the Bay Area as a whole ranks as the largest high-tech center in the United States, with 386,000 high-tech jobs, followed by New York with 316,500 jobs and Washington, D.C., with 295,800 jobs. Silicon Valley ranked highest in the concentration of high-tech workers in the United States, with 285.9 out of every 1,000 private sector jobs.[38] The region also ranks highest in high-tech manufacturing.

A recent report by the Bay Area Council states that "an educated and well-trained workforce is critical to attracting entrepreneurs and capital, achieving high rates of productivity, and spurring the innovation that lies at the heart of the Bay Area success story."[39] There are some challenges ahead as the decreasing emphasis or interest in key subjects like math, science and engineering in the nation's schools and universities has required Bay Area companies to attract large numbers of high-tech workers from abroad to meet the demand of this growing industry. It is unclear whether or not the supply of workers from overseas will be enough to meet the demand for jobs in this sector if the local supply of workers qualified to work in this industry continues to decrease. "The other challenge is replacing the hundreds of thousands workers who will retire or change occupations. Data from the California Employment Development Department show that for every opening created by job growth in the Bay Area, nearly three replacement job openings will be created."[40]

Site-Specific Implications

Since Fremont is at the periphery of Silicon Valley, it serves as a tertiary location for high-tech businesses. It serves a niche for companies that need a low-cost option in the Bay Area but don't need to be in the center of Silicon Valley. Additionally, there is still a large supply of vacant space in the core of Silicon Valley resulting from the "Dot-Com Bubble" or high technology recession of the early 2000s. High vacancy rates persist today suggesting that it could take some time for the vacancy rate to drop enough to spur development in nearby areas. Given these factors, Fremont is unlikely to attract the level of high-tech employment of cities like Palo Alto, Mountain View and Menlo Park.

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[37] Cybercities 2008: A Complete State-by-State Overview of the High-Technology Industry. American Electronics Association.

[38] Ibid.

[39] Recession and Recovery: An Economic Reset. Bay Area Economic Profile. Bay Area Council Economic Institute. April 2010.

[40] Ibid.

Clean and Green Technology

Defining the Cluster

Clean and green businesses do not form a traditional supply-chain-based industry cluster. Instead, the cluster includes all businesses involved in research and development technologies, manufacture of products, and provision of services related to sustainability and solving environmental challenges. Only a portion of clean and green businesses demand placement on industrial sites, and businesses defined as clean and green span a broad spectrum of industry sectors and employment opportunities.

The terms "clean" and "green" technology/economy are largely used interchangeably. Historically the "clean tech" was more all-encompassing than "green tech," as it was created by investors to describe asset classes of companies engaged in development and production of green technologies and processes; the latter comprised "green tech."[41] However, the widespread popularity of "clean tech" has blurred the definitions of these descriptors of green economy activities.

General discussions of the "green economy" are further confused by inclusion of two additional components: 1) businesses and homes that have a high potential for reduced environmental impacts through changing business practices and modified buildings; and 2) improved environmental sustainability through location within "location-efficient" sites (i.e., sites with transit access and built forms that encourage energy-efficient transportation decisions). These activities are among the drivers of the green economy, but the economic engine for innovation is the cluster of businesses within clean/green tech.

Overview of Global and National Existing Conditions and Trends

It is difficult to gauge the exact size and distribution of green and clean businesses throughout the world because of diverging definitions, measures, and the cross-industry nature of the cluster; instead, proxy measures exist. For example, according to a report by the Pew Charitable Trusts, clean energy investments in 2009 totaled $162 billion, with China's $34.6 billion leading the world versus the United States' second place $18.6 billion.[42] China's recent increases in investment have partly occurred in response to the nation's overwhelming domestic energy needs. The majority of clean energy investment occurs in the G-20 countries, but Turkey, Brazil, and China have posted the highest growth rates over the past five years.[43] The United States greatly lags numerous countries in public and private investment relative to GDP partly because of less aggressive clean energy generation targets.

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[41] Dikeman, Neal. "What is Clean Tech?" CNET.com. 10 August 2008.

[42] Pew Charitable Trusts, The. *Who's Winning the Clean Energy Race?: Growth, Competition, and Opportunity in the World's Largest Economies.* 2010.

[43] Breakthrough Institute and The Information Technology and Innovation Foundation. *Rising Tigers Sleeping Giant: Asian Nations Set to Dominate the Clean Energy Race by Out-Investing the United States.* November 2009.

The United States is a clear leader in clean and green economy venture capital investment, with Deloitte and CleanTech Group finding that North America accounted for 60 to 70 percent of total clean technology venture capital investment in recent years.[44] Venture capital investment is a good proxy for level of innovation within the green and clean economy since these investments are focused on innovative, highly-promising, and unique products. The high levels of venture capital investment indicate that the United States may serve as a major innovator in clean technology, but low costs and high populations in developing countries may result in offshore production and implementation of some resulting products.

Within the United States, California hosts the largest concentration of clean and green economy businesses and investment. According Pew Charitable Trusts, California drew 40 percent of global clean technology venture capital and the state led the nation in related technology patents.[45] Within California the largest sub-categories of green investment are Energy Generation, Energy Efficiency, and Transportation. The northeastern United States hosts the nation's second largest concentration of green economic activity.

Government incentives and investments help significantly drive green and clean business activity. The American Reinvestment and Recovery Act alone included $38 billion in clean energy-related programs and $20 billion in tax incentives. This package included grants to upgrade the electric grid, research and development clean energy sources, research advanced batteries (electric cars), weatherize homes, research mitigation of fossil fuel impacts, and electric car tax credits.[46] The Green Jobs Act of 2007 focused on developing a skilled workforce compatible with jobs in the green economy. Most developed nations are similarly incentivizing research and development in the clean and green technology sector.

Generally speaking, rapid and significant domestic growth is expected in jobs in the green industry cluster; projections vary, but few have attempted to quantify the tension between this job growth compared to loss or transformation of jobs in non-green sectors.

Bay Area Positioning

The potential for green business development is heightened by the Bay Area's concentration of capital and expertise, California investments and regulations that encourage green business development, and recent incentives and investment from the Federal government. Collaborative Economics' 2008 report *Clean Technology and the Green Economy*[47] found that the Bay Area leads California in number of green establishments, and slightly trails Southern California in

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[44] Cleantech Group, LLC. Press Release. January 26, 2010. Online at http:/cleantech.com/about/pressreleases/20090106.cfm.

[45] Pew Charitable Trusts, The. *The Clean Energy Economy: Repowering Jobs, Businesses, and Investments Across America.* June 2009.

[46] LaMonica, Martin. "Obama Signs Stimulus Plan, Touts Clean Energy." CNET.com. 17 February 2009.

[47] Collaborative Economics. *Clean Technology and the Green Economy.* Prepared for California Economic Strategy Panel. March 2008.

employment. The Bay Area also boasts a more diversified green business cluster, with energy generation and efficiency dominating less than in Southern California. Finally, the Bay Area benefits from its concentration of venture capital, as demonstrated by the presence of 44 of the Cleantech Group's top 100 world clean technology companies.[48]

Labor economists have expressed concern that green and clean job growth will emphasize research and development and service jobs over manufacturing; manufacturing opportunities are relatively limited since green manufacturing is still subject to the same national and global pressures as other manufacturing uses.[49,50] For example, Fremont solar energy manufacturer Solyndra—a company that has received extensive private and public investment—had been planning to expand its operations but recently reduced its manufacturing capacity as a result of competition by low-cost, high-volume Chinese producers of less advanced solar panels.[51]

In the long term, green job opportunities for blue-collar workers are more likely to be in on-site services such as construction, maintenance, or final assembly of energy generation components. Despite this long-term possibility, analysis by Collaborative Economics found that manufacturing and construction jobs made up 51 percent of California's green economy jobs in 2008, compared to 28 percent for professional, scientific, and technical services.

Site-Specific/Fremont Implications

Clean technology businesses and investments are heavily concentrated in Fremont and have high growth potential. Fremont has met with tremendous success in attracting clean technology companies and investment. According to the City's own data research, Fremont now has more than 20 clean technology firms; those firms attracted more venture capital in 2008 and 2009 than any other East Bay city, even after excluding large investments in Solyndra.[52] Fremont received $274 million of clean technology venture funding in 2008 and $331 million in 2009, ranking number one in terms of all other East Bay cities. This clean technology investment is largely driven by investments in Solyndra and Deeya Energy.[53] Fremont's major clean technology companies now include Solyndra (solar energy), Solaria (solar energy), and Tesla

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[48] City of Fremont. "Cleantech Sector Analysis and Economic Development Opportunities." PowerPoint. July 2010.

[49] Apollo Alliance. *Winning the Race: How American Can Lead the Global Clean Energy Economy.* March 2010. Pp 12.

[50] Joint Venture Silicon Valley Network. *Climate Prosperity: A Greenprint for Silicon Valley.* February 2009. Pp 13.

[51] Woody, Todd. "Solar-Panel Maker to Close a Factory and Delay Expansion." *The New York Times.* 3 November 2010.

[52] City of Fremont. "Cleantech Sector Analysis and Economic Development Opportunities." PowerPoint. July 2010.

[53] City of Fremont. "Cleantech Sector Analysis and Economic Development Opportunities." PowerPoint. July 2010.

Motors. Solaria expanded its operations in the Ardenwood area, but the South Fremont/Warm Springs Study Area provides significant land for expansion and is near to all three companies.

Biotechnology

Defining the Cluster

"Biotechnology," often abbreviated "biotech," includes any businesses engaged in the research and development of technologies that interact with biological organisms or processes to produce commercial products and applications. As such, the cluster includes both high-level scientific research activities and high-value manufacturing of resultant commercial products. Biotechnology includes the development of human medical applications as well as non-medical applications such as genetically-modified foods.

Biotechnology is a cutting-edge and research-dependent field that thrives in locations including major research universities and venture capital. Universities attract and produce high-skill researchers, and also provide initial product concepts through their research. These ideas are often commercialized through the formation of companies supported by the universities and venture capital. Alternately, well-established companies will engage in their own research and development and self-commercialize, or smaller companies will contract with large companies for production. Regardless of how the biotechnology is developed and produced, new products often undergo many years of extensive testing and regulatory approval before being sold. As a result, biotechnology companies require long-term working capital and are not quick-turnaround investments.

Overview of Global and National Existing Conditions and Trends

According to Ernst & Young's report *Beyond Borders: Global Biotechnology Report 2010,*[54] established concentrations of the biotechnology industry are located in the United States, Europe, Canada, and Australia, while China and India feature large, rapidly emerging biotechnology sectors. Small and large biotechnology companies alike compete on a global scale since product development occurs at globally-competitive institutions and companies, and manufacturing and distribution of products can be located worldwide. Global competition in all fields of biotechnology will intensify as India and China grow their educated workforces, emphasize development of cutting-edge research through government investments, and take advantage of their continued economic growth and low costs. These countries are moving from mere providers of services to research centers in their own right.

Within the United States, the largest biotechnology clusters are found in the San Francisco Bay Area and Boston regions. These regions formed the earliest concentrations of biotechnology companies in the 1970s and are distinguished by their large concentrations of universities, high-level research and development companies, and concentrations of venture capital. Major secondary but fast-growing biotechnology clusters exist in the San Diego, Raleigh-Durham, and Seattle regions, and stable concentrations exist in New York and Philadelphia because of the

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[54] Ernst & Young. *Beyond Borders: Global Biotechnology Report 2010.* 2010.

presence of large pharmaceutical and medical manufacturers.[55] Agricultural biotechnology clusters are concentrated in Wyoming, South Carolina, Wisconsin, and Montana. California includes concentrations in all major biotechnology categories except for agriculture.[56]

The United States' biotechnology industry continues to be healthy and poised for additional growth. Biotechnology employment grew by 15.8 percent between 2001 and 2008 to a total of 1.42 million jobs, rapidly outpacing overall employment growth. Approximately 90 percent of the industry's growth occurred in research and testing, thus generating high-skill, high-wage jobs. Future growth will depend on availability of venture capital, availability of government research investments, and education and attraction of high-skill workers.[57]

Bay Area Positioning

As mentioned above, the San Francisco Bay Area is one of the largest national and global concentrations of biotechnology. The region benefits from its inclusion of numerous research universities, research hospitals such as UC San Francisco, and the highest concentration of venture capital in the nation. Analysis by Collaborative Economics has shown that the Silicon Valley sub-region includes nearly 10,000 jobs in biotechnology—forming a concentration three times that of the nation overall—and over 30,000 total jobs in the broader life sciences.[58]

Looking forward, the greatest challenge to the Bay Area's biotechnology competitiveness comes from talent attraction and retention. The local biotechnology industry is well-established and dominant, but reports by Joint Venture Silicon Valley and other Bay Area economic development organizations, coupled with global growth trends of the cluster, indicate that it will become increasingly difficult to fill positions left open by retiring baby boomers. As with Silicon Valley's technology industry, biotechnology is dependent on domestic and international in-migration. Emerging biotechnology clusters elsewhere in the United States and the world may lead to these workers staying closer to home. Future competitiveness will require development of local and domestic talent, and possibly greater incentives for attracting global talent.

Site-Specific/Fremont Implications

Fremont is a competitive location for biotechnology companies, and life science companies in general. The City's 5,000 biotechnology and related life sciences jobs create a heavy concentration compared to the State.[59] However, Fremont is relatively distant from the Bay

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[55] Cortright, Joseph and Heike Mayer. *Signs of Life: The Growth of Biotechnology Centers in the U.S.* The Brookings Institution Center on Urban and Metropolitan Policy. 2002.

[56] Batelle Technology Partnership Practice. *Batelle/BIO State Bioscience Initiatives 2010.* Prepared for Biotechnology Industry Organization. May 2010.

[57] Ibid.

[58] Joint Venture Silicon Valley. *Special Analysis: Silicon Valley's Changing Industry Mix and Demand for Skills.* 2009.

[59] Economic & Planning Systems and Strategic Economics. *South Fremont/Warm Springs Area Studies: Baseline Market Analysis.* Prepared for the City of Fremont. October 2010.

Area's major research centers and venture capital providers. As a result, Fremont may be better positioned to capture biotechnology companies seeking to lower costs by locating in inexpensive land and buildings. Fremont can potentially attract cost-conscious smaller firms and large firms seeking land for expansion. The City also competes well based on its inclusion of high-quality housing and neighborhoods that are relatively less expensive compared to many Peninsula/Silicon Valley cities.

Fremont's life sciences business base expands well beyond narrow definitions of biotechnology, including a concentration of medical device companies. This diversity provides further flexibility to Fremont beyond biotechnology, given that nearly 13,000 Silicon Valley jobs are related to medical devices, even greater than the number of biotechnology jobs.[60] City staff state that Fremont competes well in attracting life science startup companies, with the successful ones often acquired by larger companies that are either kept in the City or absorbed into other facilities.

The Study Area holds potential to attract biotechnology and life science firms, but is a second-choice location compared to Ardenwood, which features easy access to the Dumbarton Bridge and, therefore, the high-skill workforce in cities such as Menlo Park and Palo Alto.

Logistics/Warehousing/Goods Movement

Defining the Cluster

This sector is comprised of businesses that are involved in the transport and storage of goods from their point of origin or manufacture to the point of consumption or end user. This sector includes businesses such as trucking, warehousing, wholesale trade and manufacturing (e.g., food and beverage manufacturing). These jobs provide relatively high wages with low educational requirements.

Overview of Global and National Existing Conditions and Trends

Over the past 50 years, the rise in globalization has resulted in a vastly more complicated and dispersed logistics network than previously existed. Goods that used to be produced locally are now produced in multiple components in several different countries before being assembled and shipped to market. Inexpensive labor overseas, inexpensive oil and improvements such as containerized shipping and other technological improvements in shipping have accelerated this trend.[61] This has led to a growth in the logistics/warehousing and goods movement industries in areas that serve as major trans-shipment points for goods such as Southern California and the Bay Area. Despite off-shoring of many manufacturing processes, the goods still need to be delivered to final consumers in the United States. With a major port and good highway

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[60] Joint Venture Silicon Valley.

[61] Corbett, James J. and Winebrake, James. Energy and Environmental Research Associates The Impacts of Globalisation on International Maritime Transport Activity: Past trends and future perspectives. November 2008.

connectivity to the western United States, the Bay Area still serves and important trans-shipment point for goods arriving from Asia and Mexico.[62]

Bay Area Positioning

These businesses are a vital part of the Bay Area economy because efficient goods movement is critical to the success of all sectors. The State has made the support and development of this industry a priority by fostering a collaboration between the California Business, Transportation & Housing Agency (BTH) and the California Environmental Protection Agency (Cal/EPA). In 2007 the agencies issued a joint *Goods Movement Action Plan* that laid out specific steps to protect the assets necessary to facilitate goods movement and address environmental challenges associated with it.[63] Because of assets important to goods movement including a major port, well-connected interstate highways and available facilities, the Bay Area was designated as one of the key areas where the collaboration should focus resources to protect these assets.

In addition, a 2008 MTC report on goods movement and land use identified industrial land in the East Bay I-80/880 Corridor from Richmond to Fremont as a key concentration of industrial land for the goods movement industry.[64] The report highlighted the fact that local land use decisions don't take into account the regional implications of converting industrial land to other uses such as residential or commercial. While industrial land uses may not be the "highest and best use" from a market perspective, over the long run, a lack of industrial land will hamper the economy and reduce the amount of goods that can be moved around and through the Bay Area.

The MTC report also measured key characteristics of the goods movement industry in the Bay Area. For example most goods movement jobs are business serving. They "sell their goods and services to other businesses, thereby supporting business activities in the central Bay Area and throughout the region." Goods movement "industries provide good-paying jobs with low barriers to entry." A large portion of the goods movement industry supports regional demand. This is demand that cannot be served by offshore companies. Employment in the goods movement industry is forecasted to grow by approximately 59 percent by 2035.[65]

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[62] NAIOP Research Foundation, Spencer, Curtis D. and Schellenberg, Steve, IMS Worldwide, Inc. Trends in Global Manufacturing, Goods Movement and Consumption, and Their Effect on the Growth of United States Ports and Distribution. September 2010.

[63] Business, Transportation and Housing Agency (BTH) and California Environmental Protection Agency (Cal/EPA) Press Release. January 11, 2007. Available online at http:/www.arb.ca.gov/gmp/docs/policy.pdf

[64] Hausrath Economics Group, Goods Movement/Land Use Project for the San Francisco Bay Area. December 2008.

[65] Ibid.

Site-Specific/Fremont Implications

Fremont and the Study Area in particular are well positioned to meet the needs of the logistics, warehousing and goods movement sector. Access to two major interstate highways, proximity to the Port of Oakland and a large workforce are all significant assets for this sector.

High-Speed Rail

Defining the Sector

This section discusses high-speed rail development and related opportunities to develop production, distribution, and/or repair facilities. These facilities could include train vehicle manufacturing and maintenance, signaling systems, technology research and development, parts manufacturing, etc.

The rail manufacturing and operations industry involves a complicated global supply-chain network that defies simple summary. Rail vehicles tend to be custom-built under unique contracts, resulting in flexible collaborations of vehicle and component makers to meet the contract's needs. High-speed rail manufacturing will involve collaborations of multiple companies, some of which lack specific expertise in high-speed rail.

Overview of Global and National Existing Conditions and Trends

The greatest concentrations of high-speed rail operations and companies are found in several European and Asian nations. The world's first high-speed rail system was developed in Japan in 1964, with European systems opening soon afterward. Today notable systems exist in Spain, Germany, Belgium, Britain, France, Italy, Turkey, Portugal, Switzerland, China, Taiwan, Japan, and South Korea.[66] China is a relative newcomer to high-speed rail—with its first line opened in 2008—but has already constructed several lines as part of a $300 billion rail upgrade and expansion plan. China is estimated to have more high-speed rail routes than the entire rest of the world by 2012.[67]

Only a handful of companies worldwide have experience with manufacturing high-speed rail trains, none of which is based in the United States. Europe's Siemens (Germany) and Alstom (France) are the most advanced manufacturers,[68] and other manufacturers include companies such as Talgo (Spain), Kawasaki Heavy Industries (Japan), Bombardier (Canada), CSR Sifang (China), and CNR (China).

The United States dedicated $8 billion in stimulus funds to high-speed rail in 2009, and in October 2010 the Department of Transportation awarded $2.4 billion for high-speed rail

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[66] James, Randy. "A Brief History of High-Speed Rail." *Time Magazine.* 20 April 2009.

[67] Richburg, Keith B. "China is Pulling Ahead in Worldwide Race for High-Speed Rail Transportation." *The Washington Post.* 12 May 2010.

[68] Gertner, Jon. "Getting Up to Speed." *The New York Times Sunday Magazine.* 14 June 2009.

development.[69] Until these commitments, the United States had all but ignored high-speed rail in the post-War period. Amtrak's Acela Express in the Northeast Corridor served as the nation's only (relatively meager) example.

Florida and California have the most extensively-developed plans for rail, with Florida likely to open the nation's first new high-speed rail line between Tampa and Orlando. California has planned its high-speed rail system since 1996, and in fall of 2008 voters approved a $10 billion bond measure to help fund construction of the approximately $40 billion system. California has since received $2.5 billion and $900 million in Federal funding for the system.[70, 71]

The United States' commitment to building high-speed rail has triggered significant interest from foreign companies and governments with expertise. These companies are likely to locate manufacturing facilities in the United States because of Buy American requirements. Political or practical expediency will probably result in partnerships between foreign manufacturers and domestic companies with experience building freight rail and traditional passenger rail. Thirty domestic and foreign manufacturers have committed to building or expanding United States facilities if selected for major rail projects.

A number of domestic and international rail manufacturers already have facilities in the United States, some of which may be retooled or expanded to accommodate high-speed rail manufacturing. According to the Duke University report *U.S. Manufacture of Rail Vehicles for Intercity Passenger Rail and Urban Transit,*[72] 20 relatively vertically-integrated passenger rail or locomotive manufacturers have facilities in the United States. Eight of these are domestic companies. Of those eight, three only manufacture locomotives (General Electric, Electro-Motive, Motive Power), and only one of the remaining firms—U.S. Railcar—has noteworthy potential for assisting in high-speed rail production.

Four rail manufacturing operations are located in California out of 35 nationally; most rail manufacturing occurs east of the Mississippi.[73] The four facilities are owned by: 1) Alstom in Mare Island, 2) AnsaldoBreda in Pittsburg, 3) Nippon Sharyo in San Francisco, 4) Siemens in Sacramento. All four facilities are related to passenger rail. Siemens and AnsaldoBreda co-located their United States headquarters at their facilities.

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[69] Lambert, Lisa and John Crawley. "U.S. Govt. Announces 2.4 Bln for High-Speed Rail." *Reuters.* 28 October 2010.

[70] Ibid.

[71] Weikel, Dan. "High-Speed Train Project to Receive at Least $731 Million in Federal Funds." *Los Angeles Times.* 26 October 2010.

[72] Lowe, Marcy, Saori Tokuoka, Kristen Dubay, and Gary Gereffi. *U.S. Manufacture of Rail Vehicles for Intercity Passenger Rail and Urban Transit.* Duke University Center on Globalization Governance & Competitiveness. 22 June 2010.

[73] Ibid.

Bay Area Positioning

General rail manufacturing is concentrated in the eastern United States, but the Bay Area is a competitive location for attracting high-speed rail manufacturing due to California's early lead in system development. While Florida's system will be built first, California's will likely be second and is much more extensive. Manufacturers would benefit from access to parts and supplies via West Coast ports.

Competition will be most intense between the Bay Area and the Los Angeles region, with each region hosting ports, existing manufacturing base, locations along the rail route, and industrial land supply. Los Angeles previously demonstrated the potential to attract companies based on rail investment by attracting a commitment from European manufacturer AnsaldoBreda to construct a 240,000-square foot manufacturing facility to produce vehicles for the County's transit agency and other customers (although the deal collapsed during negotiations).[74] An opportunity may have already been missed with Siemens, as the company has acquired 20 acres for a high-speed rail production facility adjacent to its existing light rail plant in the Sacramento area.[75]

Site-Specific/Fremont Implications

Fremont will need to vigorously compete against other cities if it is to attract high-speed rail manufacturing. Only a handful of high-speed rail-related manufacturing operations are likely to be needed in the United States, and the location of these operations will further determine where suppliers locate. The Study Area benefits from its available land and access to rail spurs that can provide parts shipped in via the ports. However, less expensive locations may be available in California, and a bidding war of public incentives may occur between cities.

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[74] Reston, Maeve. "Italian Firm Awarded MTA Contract Pledges to Build New L.A. Rail Manufacturing Plant with Union Labor." *Los Angeles Times,* L.A. Now blog. 25 September 2009.

[75] Clayton, Mark. "Companies to Build High-Speed Rail Cars in the US." *The Christian Science Monitor.* 19 February 2010.

VII. Opportunities for Bay Area/South Fremont Industrial Expansion

The context for industrial growth in the Bay Area and the City of Fremont has changed significantly in the past two decades—particularly in light of the Great Recession and its lingering effects. With increased competition from other areas with lower production costs whether in the United States or abroad, there are many industrial uses that are no longer locating in the Bay Area. There are nevertheless a number of industrial activities that continue to remain, expand, and be attracted to the Bay Area. These include firms that serve the regional economy and require proximity to their customer base, firms with a history and base in the Bay Area, and firms requiring the skilled labor pool offered by Bay Area communities. As one of the few areas in the heart of the Bay Area that combines a history of successful industrial development with more room to accommodate new industrial uses at competitive cost, the City of Fremont has the potential to continue to grow and expand its current industrial base.

Based on findings and conclusions drawn from the market demand analysis and the preceding sections of this White Paper, this chapter considers South Fremont in the context of the Bay Area and the region's larger industrial trends and evaluates the opportunities for manufacturing in Fremont and particularly in the South Fremont/Warm Springs Study Area. The City's core assets, including existing industrial business clusters and particularly those that are most likely to contribute to future industrial job growth in the City, are identified and described for purposes of framing the panel discussion.

Regional Context

Interstate 80/880 Corridor

Fremont's local economy is simultaneously tied to the economic trends of Silicon Valley and the I-80/880 Corridor. The I-80/880 Corridor is one of the largest employment centers in the East Bay, accounting for approximately 528,000 jobs, or 15 percent of the Bay Area total. Running north-south along the western edge of the East Bay, the I-80/880 Corridor traverses the western edge of Contra Costa County and Alameda County.[76]

About 27 percent of the employment along the I-80/880 Corridor, 142,000 jobs, falls under the manufacturing, wholesale, and transportation category, the ABAG-defined job category containing the most industrial jobs. This is similar to the proportion in Silicon Valley, but significantly higher than the average in the rest of the Bay Area of 20.6 percent. The level of industrial employment along the I-80/880 Corridor is tied to the history of the area and the associated advantages of proximity to the Port of Oakland and other regional transportation infrastructure. The Corridor also accounts for 20 percent of the total manufacturing, wholesale, and transportation jobs in the Bay Area.

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[76] In this white paper, the I-80/880 Corridor is defined as including the cities of Berkeley, Emeryville, Oakland, San Leandro, Hayward, Union City, Newark, and Fremont.

Silicon Valley

Silicon Valley is located in the southern part of the San Francisco Bay Area with its core represented by Santa Clara and San Mateo Counties, the definition of Silicon Valley used in this analysis. However, the strong economic connections and expanding reach have, more recently, resulted in more expansive definitions, including portions of southern Alameda County, as well as the Santa Cruz County community of Scotts Valley.

The defining characteristics of Silicon Valley are its interrelated industries and economic activities that have created a region recognized worldwide as a leader in technological innovation and progressive corporate culture. Silicon Valley is home to the headquarters of numerous internationally prominent information technology companies such as Cisco, Apple, Hewlett Packard, Google, Facebook, and Intel and Fremont-based companies like Lam Research, and Logitech. In addition, the region is home to many more small and/or start-up firms that also contribute to the region's reputation. Silicon Valley supports 1.3 million jobs, 36 percent of the Bay Area total. Similar to the I-80/880 Corridor, Silicon Valley has a high concentration of manufacturing, wholesale, and transportation jobs, especially in Santa Clara County.

The history of economic growth in Silicon Valley is closely tied to Stanford University and other Bay Area educational institutions as well as the linkages between academic and federal research and industry. Silicon Valley has been at the forefront of a number of the most significant innovation waves since 1950, including the semiconductor industry, the personal computer industry, the internet industry, and the biotech industry. It is also at the forefront of the emerging green/clean tech industry and the ongoing convergence of the biotech, nanotech, and infotech fields.

Fremont

The City of Fremont is located in the southern portion of the I-80/880 Corridor adjacent to the smaller cities of Newark and Union City as well as the City of Milpitas in Santa Clara County, and across the Dumbarton Bridge from the City of Palo Alto. Historically, its economic growth and contractions were primarily related to the economic performance of I-80/880's industrial base. However, much of the new economic growth in the City since 1990 has been tied to the economic performance of Silicon Valley and has related to established and emerging technology sectors.

Approximately 94,000 jobs are located in Fremont,[77] accounting for 18 percent of total Corridor employment. Fremont's economy has historically been linked to traditional industrial and distribution uses, though technology-related industrial uses have become an increasing part of its employment base over the last twenty years. Over 40 percent of the City's jobs, about 39,000, are in manufacturing, wholesale, and transportation. Fremont accounts for about one in four of the manufacturing, wholesale, and transportation jobs along the corridor.

While much of Fremont's existing development occurred before 1990, the rapidly expanding Silicon Valley economy of the 1990s pushed its geographic boundaries outward. Between 1995 and 2000, Fremont added 33,000 jobs, equivalent to about 12 percent of the Santa Clara and

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[77] ABAG Projections 2009 job estimates do not reflect the closure of the former NUMMI plant.

San Mateo County job growth over the same period. New industrial job growth in Fremont since 1990 has increasingly been driven by technology sectors, including the communications and computer manufacturing sector, the biotech sector, and, more recently, the clean tech sector.

The downturn of the early 2000s, followed by the Great Recession, had a significant impact on Fremont, in part because of the City's increasing focus on technology companies. The City has, however, continued to maintain a diverse industrial base over the last decade, providing a stable environment for ongoing operations, opportunities for expansion, and attractive opportunities for new firms, including a number of publicly and privately supported clean tech firms over the past two to three years.

Fremont's Key Assets

For Fremont, the competition for future industrial expansion is strong, with competing locations including Asia, other lower cost of business states, other regions in California, and other cities in the Bay Area. Like Fremont, many cities are seeking to balance the competing demands for land among residential, retail, office, and industrial uses, while expanding their economic base and improving their fiscal situation. Fremont will need to build off its existing strengths if it wishes to maintain and grow its diverse economic base. More specifically, the City will need to identify its place in the global competition for industrial jobs and protect its core assets. For firms considering locating in the San Francisco Bay Area, the City offers the following key assets.

Location

Fremont is located to the east of the San Francisco Peninsula, north and east of parts of Silicon Valley, and at the southern edge of the I-80/880 Corridor. The City is served by BART, providing access throughout the East Bay and to San Francisco and the Peninsula, and construction is set to begin next year on a second Fremont station in the South Fremont/Warm Springs Study Area. Fremont's central Bay Area location provides good accessibility for logistics and distribution businesses and provides easy access to the City for the labor force from the Silicon Valley, Peninsula, and bedroom communities in the Tri-Valley. Fremont is centrally located between the three largest airports in the Bay Area, enabling easy national and international access. These airports are San Francisco International to the west, Oakland International to the north, and San Jose International to the south. Fremont is also close to the Port of Oakland, and the South Fremont/Warm Springs Study Area is served by freight rail.

Fremont is also close to the Bay Area's national laboratories (e.g., Lawrence Livermore National Laboratory and Sandia National Laboratories) and universities, including Stanford, Berkeley, and San Jose State. The 20,000-student Ohlone College is located in Fremont and offers three biotech certificates.

Vacant Land

Although Fremont has developed the majority of its developable land like many surrounding cities, tracts of vacant land still exist, including parcels in the South Fremont/Warm Springs Study Area. With a total area of 92 square miles, Fremont has been a desirable destination for companies seeking larger plots of land and developers seeking to capitalize on these opportunities. The City has also earned a reputation as business-friendly and helpful in its assistance of development and promoting economic growth. As the City continues to evolve, it

will become increasingly important to protect compatible uses and direct future growth effectively.

Land Values and Lease Rates

Historically, Fremont's land values have been more in line with the other cities along the I-80/880 Corridor and below those of Silicon Valley and the Peninsula. As a result, Fremont has been a sought-after destination for residents and businesses seeking affordable land or building space.

Skilled Labor Force

Fremont's educated and diverse labor force helps to maintain the City's competitive edge. More than 43 percent of the population has at least a bachelor's degree, 65 percent above the State average. Furthermore, when NUMMI closed in April 2010, thousands of highly-skilled workers entered the job market. Fremont also has an entrepreneurial culture, with a significant number of small home-based businesses operating in the City.

Existing Industries

Fremont's skilled labor force has allowed the City to attract a broad range of industries. Major industries in Fremont include biotech, high tech, and a range of other firms that choose to locate in proximity to research, assembly, and production facilities. The City has been home to the facilities of some of the largest companies in the Bay Area, including Lam Research, Boston Scientific, 3ParData, and ASI Corp. It also includes a number of prominent clean tech firms, including Solyndra, Deeya Energy, and Tesla. The large base of Fremont's existing industries presents expansion opportunities and additional appeal to attract new tenants.

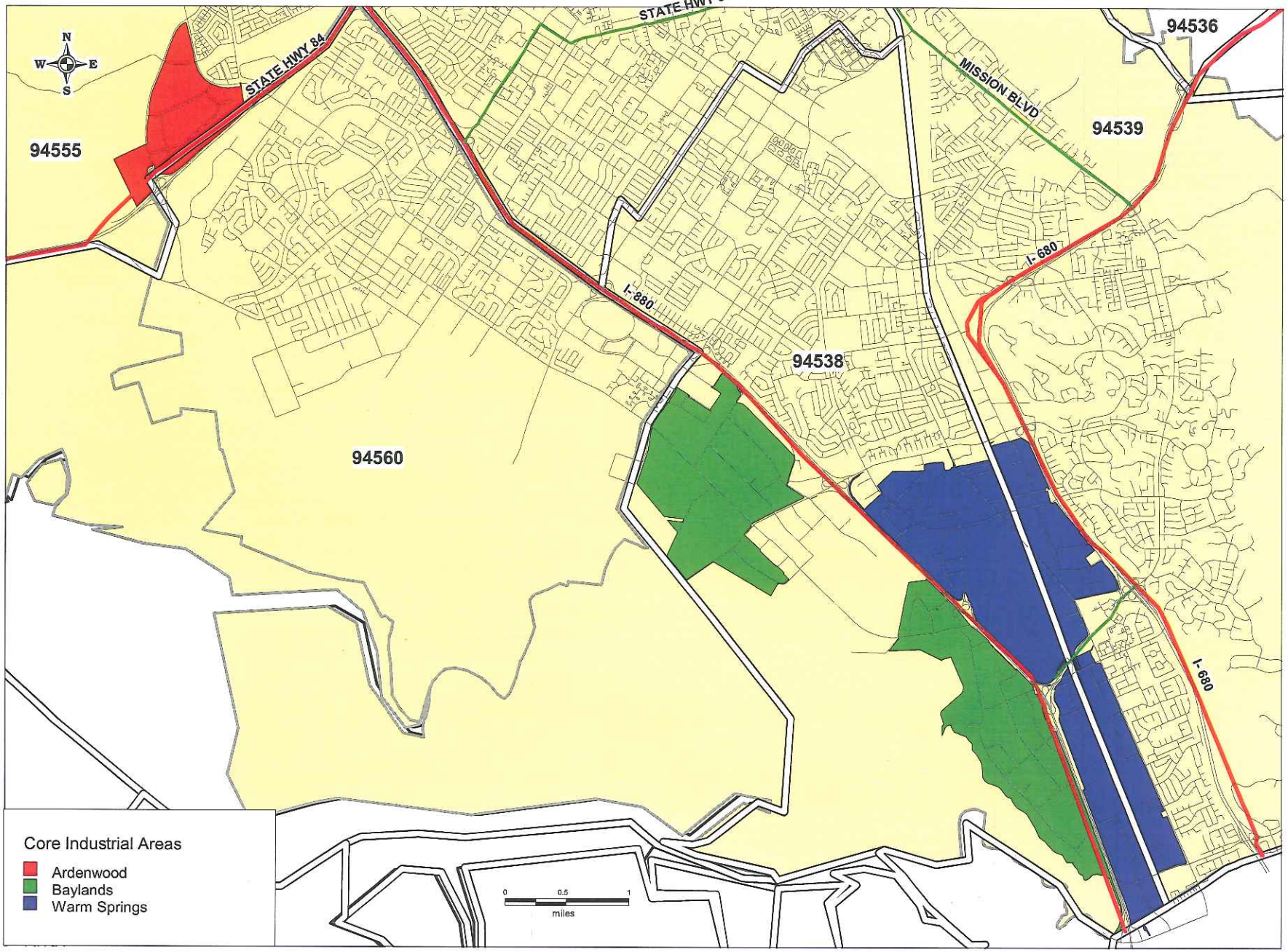
Fremont Industrial Areas

Ardenwood

Figure 18 shows the boundary of the Ardenwood core industrial area. Located at the Highway 84/I-880 junction, Ardenwood is characterized by 2- to 4-story business parks with office, R&D, and manufacturing buildings. Since the 1990s, it has accommodated a large number of new businesses and developments and attracted many biotech and information technology firms.

Ardenwood comprises approximately 350 acres, bounded by vacant land to the northwest, with existing and planned residential development along its eastern border. Highway 84 divides the District from the City of Newark, where the former Sun Microsystems campus and additional business parks comprise a significant amount of office/R&D space. Although more than 1.1 million square feet of commercial space has already been developed by Peery Arrillaga and Sobrato Development Corporation to accommodate the growth of the 1990s, there is still a substantial amount of vacant land within the District.

Figure 18:
Core Industrial Areas



The area's easy accessibility to the Peninsula, newer building inventory with 1997 as the median construction year, and availability of suitable space have historically appealed to many new businesses, the majority of which are in the biotech and computer and communications manufacturing clusters. Many tenants, driven by lower rents and flexibility of space, have relocated to Ardenwood from the Silicon Valley and the Peninsula where workspace rents have been significantly higher.

Interviews with business owners and brokers suggest that Ardenwood has strong economic ties to Silicon Valley and is regarded as a higher-end location relative to Fremont's other industrial areas. Modern workspace design and large R&D inventory are able to accommodate various users, including biotech and information technology companies.

Baylands

Bayland's character is of a more traditional industrial nature compared to Ardenwood, and has stronger economic ties to the I-80/880 Corridor as well as the Silicon Valley. In particular, the northern part of Baylands around Stevenson Boulevard includes concrete manufacturers and other similarly heavy industrial operations. Areas along I-880 to the south tend to feature higher-end, single- story R&D/manufacturing buildings and office parks, the majority of which are relatively new. Baylands also includes highway-oriented retail centers along the northwest portion of Stevenson Boulevard. The majority of the district is located in a Redevelopment Project Area.

Baylands includes some of the largest business parks in the Silicon Valley, such as Bayside Business Park and Bayside Technology Park. Pacific Commons, located on former industrial land is also in the greater Baylands area and features large-format big box retail with tenants such as Costco, Kohl's and Circuit City. Despite ongoing changes, there are large undeveloped tracts of land still available in the north and south Baylands industrial areas. Amenities in Baylands include wide tree-lined streets and sidewalks. These amenities have historically appealed to heavier industrial uses, such as manufacturing and warehousing, though the mix of tenants has expanded to include semiconductor, biotech, engineering, and logistics industries since the 1990s.

Baylands Business District is accessible by I-880 and includes significant employment in a number of driving industries, including computer and communications manufacturing, distribution and logistics, biotech, and software and communications technology. Prominent employers include Smart Modular Technologies, Lam Research Corporation, Boston Scientific Corporation, and Asyst Technologies. Employment in the driving industries is estimated at over 20,000 jobs.

Warm Springs

Warm Springs is located in southeastern Fremont, between Interstates 880 and 680. The north portion of the district (north of Mission Boulevard) is dominated by the former New United Motor Manufacturing, Inc. facility, now owned and operated by Tesla, and a mix of warehouse space along Warm Springs Boulevard. The area south of Mission consists of low-rise R&D and warehouse space, with pockets of vacant and underutilized land interspersed between a mix of

older industrial businesses and a few newer businesses. The Warm Springs area is slightly smaller than Baylands and significantly larger than Ardenwood.

Warm Springs has the highest employment in the driving industry sectors at about 35,000 jobs. Tenants include a number of technology companies engaged in software, hardware, telecommunications, semiconductors, biotech, and clean tech. Companies include Western Digital, Stats CHIP Pac Ltd Thermo, Seagate Technology, Wintec, and Solyndra. Warm Springs employs significant numbers in the computer/communications manufacturing, diversified industrial support, distribution and logistics, and software and communications clusters. It also includes the company Solyndra that currently represents the majority of jobs in Fremont's clean tech cluster.

South of Mission Boulevard, Warm Springs is bounded by older residential neighborhoods on the east, with some new residential developments being permitted and built on the former industrial land at the southern end. Warm Springs is planned to become home to a new BART station, located at Warm Springs Boulevard and Grimmer Boulevard. Construction of the BART station will likely increase the area's appeal and offer better transit accessibility.

Potential Future Opportunities for the South Fremont/Warm Springs Study Area

Clearly the Bay Area offers many opportunities for future economic growth across a range of key industries. And, starting as far back as the 1960s, Fremont has been very successful at capturing successive waves of Bay Area industrial expansion because of the City's strong location, available land supply, and positive business climate. So, while NUMMI's departure has created a major challenge for the City and for many businesses throughout California, Fremont seems poised to participate in the next round of industry expansion as well. Tesla, and its willingness to co-locate with a broader range of land uses could represent a significant new opportunity for Fremont to both attract new "cutting edge" industries and create an urban mixed use district oriented around the BART station.

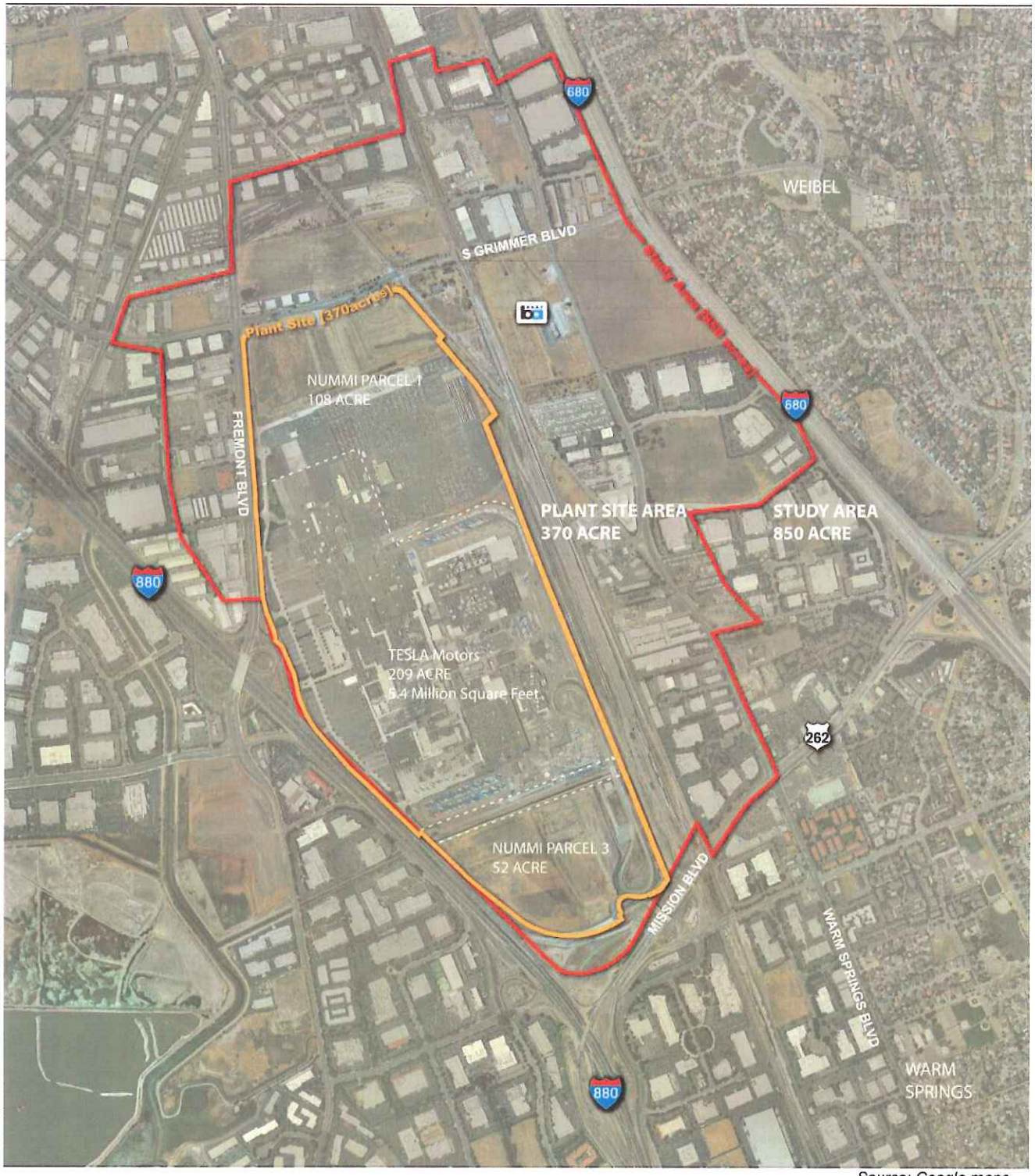
However, as the many Panelist Questions for Consideration in the first chapter of this report imply, it will be very challenging for Fremont to actually capitalize on the potential opportunity. The Panel discussion surrounding these questions will help the consultant team formulate a realistic and empirically based set of land use alternatives for the Study Area, and will provide additional input to the public discussion on the Study Area's future. At the end of this process, the final South Fremont/Warm Springs Land Use Plan will be successful if it helps the City continue to attract businesses, on the leading edge of technological innovation, continues to support and expand the City's existing employment base, and creates additional opportunities for people to live in neighborhoods that are healthy and offer a range of housing and mobility choices.

Appendix A
Area and Site Maps

Economic & Planning Systems, Inc.

STRATEGICECONOMICS

Figure A-1: Site Aerial



Source: Google maps

Figure A-2: Opportunities and Constraints - Industrial

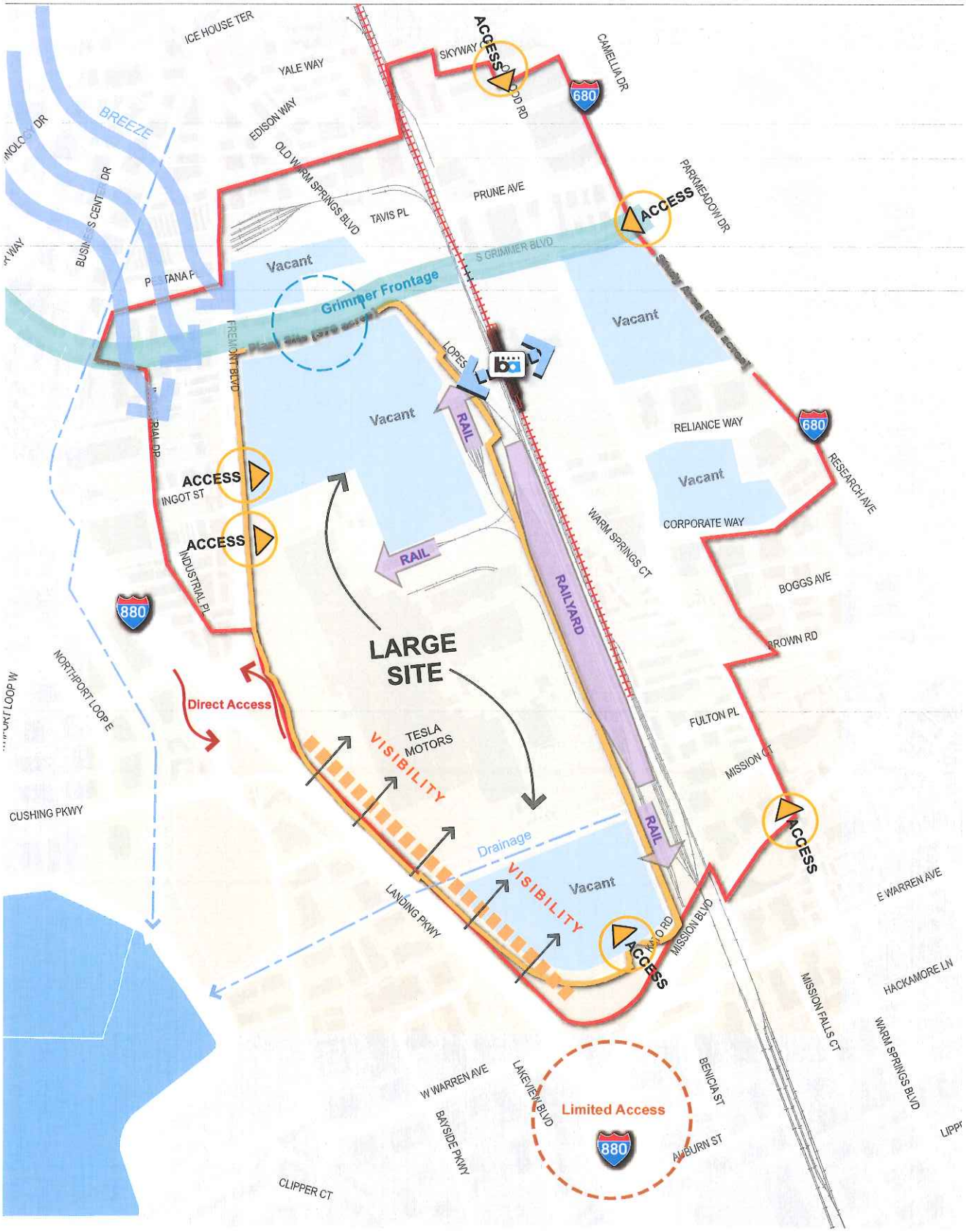


Figure A-3: Opportunities and Constraints - Mixed Uses